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Annotated Bibliography on Reproductive Health Hazards in the Workplace in Canada

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ANNOTATED BIBLIOGRAPHY ON REPRODUCTIVE HEALTH HAZARDS IN THE WORKPLACE IN CANADA

WOMEN'S BUREAU, LABOUR CANADA

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INTRODUCTION

The subject of reproductive health hazards is of increasing concern to working women and men. The popular press abounds with the tragic stories of particular children whose birth defects are suspected to result from their mothers' exposure to some chemical, or of the many pregnancy problems expected to result from a Bhopal or Chernobyl disaster. There are occasional reports of unexplained clusters of birth defects and pregnancy problems among women who work in a particular place. Heightened awareness of environmental issues is also a reason for the increasing concern, as is expanding scientific knowledge about fetal development and reproduction.

Women are having fewer children and having them later in life. When choosing motherhood, women want assurance that they can have healthy children. Since the majority of women are now in the paid labour force, the relationship between work and reproduction is of great importance to individual families and to Canadian society. Questions arise, and are debated, about the organization of work in our society, the safety of our workplaces, the lack of scientific knowledge about the health effects of thousands of chemicals in industrial use, priorities of governments and industry, equal opportunities for women in employment, and the rights of the child. Employer groups are expressing concern about legal liability resulting from damage to a child whose mother worked in a hazardous situation.

This bibliography was compiled as a guide for anyone who wishes to obtain more information on the subject of reproductive health hazards in the workplace. It will be of interest to women's organizations, unions, governments, health professionals and employers, as well as the concerned parent or prospective parent.

The emphasis is on Canadian material and experience since 1980 and relevant legal cases since 1970. It includes social, legal, medical, economic, scientific and political research and arguments which commonly arise. The issues addressed in the material include: hazards of women's jobs traditionally considered safe; reproductive hazards to men; protective and anti-discrimination legislation; exclusionary policies of employers; hazards associated with video display terminal (VDT) use; and strategies for achieving healthier and safer workplaces. On some subjects, there is a divergence of opinion and or approach. There are references to Canadian research in progress, important legal cases and pertinent legislation.

The material included does not constitute an exhaustive list. Entries were chosen through a search of various libraries and resources at the Canadian Centre for Occupational Health and Safety; universities were consulted regarding research in progress; suggestions and additions were received from a number of experts in the field. The number of entries indicates strong Canadian interest in the subject area. It is hoped that this bibliography will assist those already working in the area as well as those who wish to learn more about work-related reproductive hazards.

This bibliography was originally completed in March 1986 and updated in February 1987. Where possible, dates of future presentations or publication of studies have been amended since February 1987.

I. BOOKS, ARTICLES AND OTHER DOCUMENTS INCLUDING REPORTS, SPEECHES AND BACKGROUND PAPERS (PUBLISHED AND UNPUBLISHED)

1. **Advisory memorandum 82-VI to the Minister of Labour: February 25, 1983. Toronto: Advisory Council on Occupational Health and Occupational Safety. Fifth Annual Report: April 1, 1982 to March 31, 1983. Vol. 1, pp. 194-209.**

Prepared by the Task Force on the Possible Health Hazards of Visual Display Units, this report focuses on the radiation spectrum associated with visual display units (VDUs) and on the possible reproductive hazards associated with working on these devices. Several recommendations are made.

The report describes the various electromagnetic radiations (EMs) emitted by VDUs and discusses their potential hazards. Although tests of VDUs have shown negligible ionizing radiation emissions, units tested represent only a small fraction of machines currently in use. It is possible that there are machines which, due to malfunction or manufacturing defects, emit ionizing radiation in excess of current standards. It has been proven that there is a continuous dose-response relationship between absorbed radiation and biological effect. Any exposure produces some degree of increased risk. The Task Force recommends increased surveillance of visual display units for ionizing radiation at the point of manufacture and during the life of the equipment in accordance with a test protocol developed by an appointed committee.

For non-ionizing radiation emissions (ultraviolet, infrared, microwave and radio frequency (RF)), the report points out a lack of scientific knowledge on the effects of RF fields generated by VDUs on human health, especially in relation to electrostatic fields, extremely low frequency electric fields, and very low frequency modulated radio frequency fields. It is recommended that the Ministry of Labour work with other interested government agencies to require manufacturers of VDUs to provide electrical shielding of each unit as a whole and of the flyback transformer (major source of RF emission) in particular.

The report summarizes the incidence of clusters of adverse pregnancy outcomes for workers using VDUs in North America. It also reviews the major epidemiological studies undertaken to determine reasons for the clusters. However, because a causal relation between reproductive outcome and time spent working on or near a VDU has not yet been established, the Task Force recommends well-designed epidemiological studies and animal studies to investigate the possible association between working with VDUs and abnormal reproductive function.

Due to the uncertainty that will remain concerning the hazardous effects of VDUs until more substantial study is undertaken, the Task Force recommends that the Ministry of Labour require employers to arrange reassignment of the pregnant worker in both public and private spheres without financial penalty or loss of benefits. If reassignment is not possible, the Task Force recommends that the pregnant VDU operator receive full compensation without financial penalty or loss of benefits through a program worked out with the Workers' Compensation Board and other appropriate government agencies.

2. **Beauchamp, R.S. "Genetic testing in the workplace."** ***Occupational Health in Ontario*****, 3, No. 3 (1982), pp. 140-153.**

Methods of genetic testing are reviewed and evaluated. Of particular interest are 1) "genetic hypersusceptibility" tests, which are used as part of pre-employment screening programs to detect individuals who may be especially susceptible to workplace hazards; and 2) tests that biologically monitor workers exposed to certain hazards to detect possible DNA damage. Because many of the long-term, deleterious effects of hazardous chemicals (mutagenisis and carcinogenesis) result from damage to DNA, such tests may be an important protective device.

It is concluded that there is a fundamental difference between these two categories of tests.

On the one hand, there is little evidence linking any genetic condition with an increased risk of developing occupationally related disorders. Therefore, in general, routine screening for "genetic hypersusceptibility" is not warranted. The paper discusses several political and ethical issues raised by this kind of testing.

On the other hand, biological monitoring is more widely accepted. However, the fact remains that the clinical significance of this kind of testing is not understood. For example, it is not known whether a particular individual with a high frequency of chromosome aberrations or sister chromatid exchange (SCE) has an increased risk of developing cancer or producing offspring with birth defects. At this time, removing individual workers from their jobs because of positive test results is generally not warranted. These tests should still be considered as research tools.

3. **Bélanger, Suzanne, "Le retrait préventif de la travailleuse enceinte."** ***Canadian Journal of Women and the Law*****, Vol. 1, No. 2 (1986), pp. 498-504.**

The article examines the Quebec legislation providing protection for pregnant and nursing women whose working conditions expose them or their fetuses to danger (see Section IV). The author looks at the applications for protective reassignment, between 1981 and 1983, which are made predominantly by service sector workers (72 percent). Sixty-two percent of requests were approved, citing risks such as working positions and standing, lifting heavy loads, and exposure to radiation. The author analyzes limitations of the law as a preventive measure, in its concrete applications, and consequences to workers who exercise their rights under the Act. Delays in processing the transfers often result in risks to the fetus between the second and eighth weeks, the most dangerous for the fetus. Many women do not know their rights, and physicians sometimes fail to co-operate. Women who apply for protective reassignment are often subject to reprisals. In some cases, the author notes, employers are choosing to employ men rather than women, or women past childbearing age. Several improvements are suggested -- including more research on work and reproduction, more publicity among women about their rights, particularly in ethnic communities and the medical profession. The author concludes that workplaces have to be made healthier for both men and women and that improved federal and provincial legislation is necessary.

4. **Bertinuson, Janet. "Occupational Health and Safety: Working Women, They Face a Variety of Hazards Arising from the Types of Jobs they Hold."** ***The Facts, Canadian Union of Public Employees*****, Vol. 7, No. 1 (1985), pp. 32-36.**

Although women make up 42 percent of the work force, the majority are still clustered in occupationally segregated jobs. Eighty percent of working women hold jobs in six major occupational groupings - clerical, services (waitresses, hairdressers), sales, medicine and health, administration and teaching. Occupational segregation means that certain hazards will affect women more than men. The author lists several reasons why it is imperative to study occupational problems faced by women:

- "women's work" has often been presumed safe and few studies have been carried out to dispute this assumption;
- when women do complain about such problems as indoor air pollution, they are treated as neurotic or bored;
- women's ability to become pregnant has often led to their exclusion from jobs considered endangering to the fetus;
- stress on the job must be documented in conjunction with the load of work in the home.

The information gathered on specific hazards and health problems associated with certain occupations is enough to warrant further study and action. The article outlines various problems that stem from work situations in which the majority of women find themselves. These include: inadequate workplace and job design that creates stress, repetitive motion, tendon and nerve injuries, and backaches; use of VDTs and accompanying physical discomforts such as eyestrain, muscle strain and stress; lifting unreasonable weights; stress due to workload at home, lack of control in workplace, job insecurity, inadequate staffing levels and shift work; chemical and biological hazards; and reproductive hazards.

Chemical and biological hazards have not been as well-documented in typically women's work as opposed to such hazards that confront workers in traditionally male occupations. Examples given include chemicals from copying machines, glues, new carpets, and solvents in offices in tight buildings; carcinogens and mutagens such as ethylene oxide in hospitals; and anesthetic gases shown in studies to cause birth defects and miscarriages. Laboratory workers, teachers and health care workers are also mentioned in association with such biological hazards as bacteria and viruses.

A section on reproductive hazards discusses the need to understand the effects of work on pregnancy due to the different physiological changes a pregnant woman goes through. It is emphasized that the choice about working must be made individually in consultation with a physician, since each case is unique. The effects of reproductive hazards in general on the body and fetus are mentioned and some specific hazards are listed.

The article concludes that the issue of reproductive hazards is not solely a woman's problem. The attitude that reproductive hazards concern only women has led to the exclusion of women from certain jobs where embryotoxic agents are used. However, the workers that remain in the workplace are still at risk because many substances linked to fetal damage also cause mutations and may cause cancer. For men and women to work together to make the workplace a safer environment, information and support are needed. Group action is the best method of pressuring for change because it makes it difficult for employers to shift the blame for problems onto individuals -- their lifestyles, work habits or personal hygiene.

5. **Bertinuson, Janet. "The Reproductive Rights of Workers." Presented at the Fourteenth Annual Health and Safety Conference, Canada Safety Council. Calgary, Alberta, October 6, 1982, 9 pp. (unpublished)**

This paper deals with how workers can be protected from reproductive hazards and what their reproductive rights are. It discusses occupational health and safety legislation across Canada, which provides varying degrees of rights depending on the jurisdiction. These include the right to refuse work, to have access to information on workplace hazards, and to participate on health and safety committees. Protective reassignment legislation in Quebec is discussed -- both section 40, which specifies transfers for pregnant women or wage compensation if transfers are unavailable, and section 32, which gives a worker whose health shows signs of deterioration the right to transfer until health or the working conditions improve.

In the past the emphasis of research on reproductive hazards has been on the fetus. Consequently workplace policies have excluded women of childbearing age from hazardous jobs in order to protect the fetus.

Exclusion, however, does not eliminate the hazards and is in conflict with human rights legislation and the Constitution Act, 1982. It also denies men who remain in the workplace protection against hazards. Excluding fertile women from jobs can be seen as discrimination on the basis of sex. In one federal labour dispute, the ruling was that "pregnancy" could be included in the definition of discrimination on the basis of sex. The Atomic Energy Control Board, due to pressure from the Canadian Human Rights Commission, has ruled that limits for levels of radiation will be the same for men and women.

The only acceptable argument for excluding women could be based on the "Bona Fide Occupational Qualification" found in most human rights legislation, which relies on the employer being able to show that qualifications required for a job have a direct bearing on the employee's ability to perform that job. However, the exclusion of women of child-bearing capability is not based on job performance requirements but on a so-called protective concern for the health of the potentially pregnant worker.

Collective bargaining is a means of protecting workers from reproductive hazards. Union contracts can include or strengthen sections that call for the formation of health and safety committees, that promote the right to refuse unsafe or unhealthy work and have access to information on all materials used or produced

in the workplace, and that specify transfers for pregnant women or for men and women planning to conceive, with no loss of pay, seniority or benefits and paid disability leave if transfer is not possible. There is a gap between legislated rights for workers and government research, education and enforcement.

6. **"Birth Defect and Miscarriage Clusters Stir Up More Fears Over VDTs."** ***Microwave News*****, 1, No. 10 (1981), pp. 1-3.**

Various opinions from labour, the scientific field and industry are examined concerning potential reproductive harm of VDTs. Labour maintains the clustered occurrences of adverse reproductive outcomes for VDT workers could not be simply due to chance, whereas experts in industry and science argue that the radiation risks from VDTs are negligible. The article describes the clusters at Sears, Roebuck and Company, Defence Logistics Agency, Air Canada and the Toronto Star.

7. **Brown, Jacqueline. "Modern Myths about Working Women."** ***Occupational Health and Safety in Canada*****, 1, No. 2 (1985), pp. 22-24, 65.**

Through interviews with several women working in the field of occupational health and safety, the article sets out to dispel some of the myths about working women that hamper full recognition of the serious health and safety problems they face. These myths include the belief that traditional occupations for women such as health care and office work are clean and safe; that women work for pin money, not out of necessity; that pregnancy, childbirth and the anatomical differences of women are not the concern of employers; and that women's occupations are not as stressful as those held predominantly by men.

8. **Bryant, Heather. "Reproductive Hazards of the Workplace, Part 1: Overview".** ***Alberta Occupational Medicine Newsletter*****. Summer, 1983.**

This introduction to a series of three articles examines why reproductive hazards have become such a pressing concern. The reasons include the growing number of women of fertile age in the workplace, groups of workers becoming more public about their concerns (e.g., VDT workers experiencing clusters of adverse reproductive outcomes), and the need for physicians to have specific information on workplace hazards in order to properly advise pregnant patients. Organized research into reproductive hazards must be undertaken before, not after, workers exhibit reproductive problems. Of primary importance is the exploration of how employment in general affects pregnant women in order to establish a norm for research. It would then be possible to calculate standards like expected fertility patterns of working women and consequently determine what the deviations are. For future epidemiological studies, it is important that physicians and employers keep better records of the occupational experience of workers including exposure conditions.

9. **Bryant, Heather. "Reproductive Hazards of the Workplace, Part 2: Effects on the Female Worker."** ***Alberta Occupational Medicine Newsletter.*** **Fall, 1983.**

This article examines the effects of workplace conditions on the fetus but emphasizes that there are other reproductive processes equally important to study, such as menstrual patterns in women and male sexual functioning. It is important to know the overall effect of work itself on pregnancy. Such information will help physicians advise pregnant women on courses of action in the workplace. It may be possible that women who are at work, aside from choosing to work, may be there because of relatively poor reproductive health, whereas women remaining at home and raising children are proven to be reproductively healthy. This raises the possibility that working women are already at a selection disadvantage before an epidemiological study is begun.

Some studies of the effects of work on pregnancy indicate working women have higher rates of premature delivery, lower birth weights, and an increased risk of spontaneous abortion. However, the studies were prone to recall error and lack of control for lifestyle factors.

The article reviews the effects of lead and anesthetic waste gases on women's reproductive outcomes, analyzing the soundness of the methodology of some of the epidemiological studies, such as selection and recall bias. It also discusses hazards experienced by women working in laboratories, with VDTs, and with viruses. In laboratories a risk of spontaneous abortions and congenital malformations has been established, but the difficulty has been in linking the outcome to a particular substance.

10. **Bryant, Heather. "Reproductive Hazards of the Workplace, Part 3: Effects on the Male Worker."** ***Alberta Occupational Medicine Newsletter***, **Winter, 1983-84.**

Research into effects of workplace toxins on male reproduction is a field still in its infancy. Much of the research has been based on anecdotal reports of male workers. This has, however, alerted physicians to take occupational histories in order to discern how job exposures might relate to male reproductive problems. The article reviews studies on lead, dibromochloropropane (DBCP), vinyl chloride and waste anesthetic gases. A study on lead has shown abnormal semen analysis and difficulty with potency and libido. DBCP was found to cause infertility among male workers. Vinyl chloride is a known carcinogen and was shown in one study to cause higher rates of miscarriage among exposed workers' wives. However, the methodology used was criticized because the male workers, instead of their wives, were questioned about the miscarriages. Also mentioned as harmful to male reproduction are diethylstilbestrol, manganese, inorganic mercury and kepone. However, the damage has been attributed to intense toxic exposures, and it is difficult to extrapolate reproductive risks at the more usual low but chronic exposure levels.

More research and improved study techniques are needed to identify reproductive hazards. Rather than waiting for effects to become so widespread that toxicity is obvious before studies are initiated, employers must develop monitoring techniques to identify potential hazards early.

A resource list for physicians on reproductive hazards is included.

11. **Canada Safety Council and Canadian Advisory Council on the Status of Women. "Effects of physical and chemical hazards on the reproductive health of male and female workers." In: Canada Safety Council Data Sheets, Ottawa. J-1, 1981, 3 pp.**

Research findings on various chemical and physical reproductive hazards are compiled with the objective of drawing both workers' and employers' attention to the potential damage certain substances can cause and the necessity of ensuring reproductive health in the workplace.

A brief introductory section describes the possible effects workplace hazards can have on reproduction including interference with sexual functioning, lowered fertility, genetic damage, harm to the developing embryo fetus (birth defects, miscarriage, cancer), and harm to the offspring after birth through breast milk or contaminants brought home on work clothes. Several impediments to progress in reducing reproductive hazards are listed: expense of scientific investigation; difficulty and reluctance in extrapolating animal experiments to human situations; reluctance of workers to divulge information of a sexual nature; the costs of cleaning up the workplace; the increase in the number of chemicals on the market due to technological growth; and the myth that the problem is solely a woman's issue.

The information on chemical reproductive hazards is broken down into tables that categorize the hazard, its state at room temperature, where the hazard is encountered, and the reproductive effect. All information is documented by titles of research studies, the majority pre-1980. **Proven** hazards include: anesthetic gases, carbon disulphide, hormones, lead, mercury, pesticides, polychlorinated biphenyls, and vinyl chloride. **Potential** hazards include: aromatic hydrocarbons, carbon monoxide, carbon tetrachloride, and chloroprene. **Suspected** hazards include: arsenic, beryllium, cadmium, chloroform, dimethylformamide, lithium, and nickel. For physical reproductive hazards, proven hazards include ionizing radiation and non-ionizing radiation. Potential hazards include heat, noise and vibration.

The final section looks at responsibilities of the employer to ensure health and safety in the workplace by becoming aware of the nature of reproductive hazards and the effects on the body, passing the information on to workers, and introducing controls to keep the hazards at a minimum. Workers' rights are discussed in terms of legislation, the work of unions and health and safety committees, and the extent to which workers have the right to refuse work, participate in decision making and have access to information about hazards in the workplace.

12. **Canadian Centre for Occupational Health and Safety. "Video Display Terminals (VDTs): an Occupational Health and Safety Bibliography with Selected Annotations." Hamilton, 1984, 45 pp.**

Contains information on general and bibliographical works, guidance, work organization: psychosocial factors and job design, ergonomics, electromagnetic emissions: ionizing and non-ionizing radiation and adverse effects on reproduction.

13. **Canadian Human Rights Commission. "Policy on Pregnancy and Childbirth Discrimination." Ottawa, March, 1987, 2 pp.**

"Equal opportunity in employment for women has been significantly impaired by the economic penalties and involuntary career interruptions associated with pregnancy, childbirth and recovery. The Canadian Human Rights Commission has dealt with a considerable number of complaints in this area." To clarify its position on these problems, the Commission has stated "that for all employment related purposes... an individual temporarily unable to work, or put at risk by continuing to work, for medically certifiable reasons related or unrelated to pregnancy or childbirth, but occurring at the time of pregnancy or childbirth, shall be treated at least as favourably as any other individual temporarily unable to work or put at risk by continuing to work for medically certifiable reasons". This includes access to benefit plans. The Commission has also decided that "if a health and safety hazard affects both sexes, a policy directed at women only will be considered discriminatory," and "if a hazard affects only pregnant women, a policy directed at all women capable of childbearing... but not pregnant, will be considered discriminatory." In this policy statement, "reasons related to pregnancy and childbirth" include the health of the fetus and expectant mother, as well as complications of pregnancy and childbirth". In addition "the granting of special leave or benefits to female employees in connection with pregnancy or childbirth... is not discriminatory".

14. **Canadian Medical Association. "CMA Policy Summary: Video Display Terminals". *Canadian Medical Association Journal*, Vol. 135, No. 6 (1986), p. 688-A.**

"[In response to] numerous requests from the public concerning the potential hazards of video display terminals (VDTs), the CMA issued a statement in 1983 summarizing its views on the use of VDTs.

"Many reputable scientific surveys have shown that VDTs do not emit ionizing radiation (x-radiation). This observation is substantiated by the findings of the Radiation Protection Bureau of the Health Protection Branch, Department of National Health and Welfare, in the course of its compliance activities under the Radiation Emitting Devices Act. In reaching this conclusion, the bureau tested 300 VDTs, including 150 different models.

"Studies also conclude that the emission of nonionizing radiation from VDTs (e.g., ultraviolet, visible light, microwave, radio frequency and infrared) is well below even the most rigorous standards. Extremely low-frequency, pulsed

electromagnetic radiation from VDTs is not considered to be a risk, although the biologic[al] effects continue to be studied.

"The health problems experienced by many VDT operators are, according to the best knowledge available, essentially ergonomic, being related to the physical characteristics of the workplace. VDT users more often have visual, musculoskeletal and stress-related complaints than other workers. Proper ergonomic standards (e.g., appropriately designed workspaces, approved office furniture and machines, adequate lighting and glare reduction, regular rest breaks, and suitable environmental conditions) should be encouraged in the workplace to maximize [the] comfort of VDT operators.

"In summary, the CMA believes that VDTs do not emit x-radiation, and there is no evidence that nonionizing radiation from VDTs can produce biologic[al] effects or pose health hazards. The association urges appropriate authorities to publicize as widely as possible the information contained in its statement."

15. **Canadian Labour Congress. "Women and Health and Safety." Ottawa, 2 pp.**

This pamphlet alerts women to the fact that, contrary to myth, their jobs are neither healthy nor safe. A number of common risks are presented, including physical hazards (noise and vibration), chemicals and radiation, stress, and biological hazards. The point is made that women often endure unhealthy working conditions because they lack union protection. The pamphlet addresses the issue of reproductive hazards specifically, criticizing the practice of using different safety standards for women and men, which excludes women from certain jobs and leaves male workers and their families exposed to the hazards.

The argument is made that union women must become more involved in health and safety issues, through local union women's committees, health and safety and bargaining committees, to ensure safer and healthier workplaces. Better legal protection for all workers is needed, but must be backed up by strong health and safety clauses in collective agreements.

16. **Cohen, Marcy and Margaret White, *Playing with our Health: Hazards in the Automated Office*. Vancouver: Press Gang Printers for Women's Skills Development Society, 1986, 106 pp.**

"An education and resource guide for clerical workers, union officials, students and teachers interested in health and safety problems of video display terminals", this handbook contains much useful information on work stress, radiation hazards, and taking action on health and safety, including workers' rights with specific reference to VDTs.

The section on radiation and pregnancy states that "the most current research on VDTs [and] abnormal pregnancies argues that the current radiation standards are outdated and do not adequately protect VDT operators from reproductive hazards and proposes several solutions that would better protect the reproductive rights of VDT operators". References to three large-scale studies indicate high miscarriage and birth defect rates for VDT operators, including the children of

male operators. Simple explanations are included of scientific research, the technical aspects of radiation, and how radiation affects the reproductive cycle. Details are provided on how to protect VDT operators from radiation and sample contract language for collective agreements. Each of the three sections is followed by suggested activities for group exercises and discussions. Appendices on laws and regulations on VDT workplaces and health and safety procedures and sample health questionnaires are very useful.

17. **Commission de la santé et de la sécurité du travail du Québec. "Protecting the Pregnant or Breast-Feeding Worker; The Right to Protective Reassignment." 1984. 32 pp.**

This brochure details the steps employees, doctors and employers must take to comply with the right in Quebec for protective reassignment for workers who are pregnant or breast-feeding. It discusses the forms that must be filled out, consultation with a workplace physician or a Community Health Department doctor, and conditions under which the right will be accepted (e.g., reasons must be work-related and not due to purely personal medical problems).

Terms of payment are specified. If reassignment puts the applicant in a lower paying category, the difference will be paid by the Commission de la sante et de la sécurité du travail du Québec based on a request from the employer. If an applicant cannot be reassigned, the Commission pays 90 percent of retained net income. All benefits and seniority are retained by the applicant and her job must be given back after the baby is born. Appeal procedures are outlined.

The brochure discusses what are proven reproductive hazards according to scientific studies, listing ionizing radiation, lead and anesthetic gases as examples. It emphasizes the need for more epidemiological and toxicological research as well as the setting of criteria for exposure limits that take into account specific biological characteristics of male workers, female workers of child-bearing age, and the unborn child. Tables showing the reproductive risks of working in various economic sectors are presented at the back of the brochure.

18. **DeMatteo, Bob. *Terminal Shock, The Health Hazards of Video Display Terminals*. Toronto: NC Press, 1985, 224 pp.**

This book presents a thorough description of video display terminal use in Canada and the United States, detailing the nature of the machine and its emissions, its adverse health effects, and general office ergonomic problems associated with its use. As well, analysis is presented of scientific evidence concerning VDT hazards, legislation and regulation in several countries, political debate, workers' action, and case studies of adverse reproductive outcomes.

The introduction discusses the poor record of attention paid to health and safety concerns in North America. It documents the history of industrial cover-ups and negligence in the case of hazardous substances like asbestos. It also documents intense pressure from computer companies and their associations to block VDT safety bills. With respect to microwaves and other non-ionizing radiation

studies, scientists have had their funding cut off by powerful industrial or military concerns when the studies indicated adverse effects.

One of the central focuses of the book is the effects on the body of low level radiation emitted by VDTs. Clusters of adverse reproductive outcomes of VDT workers in Canada, the U.S. and Europe are documented. Other adverse effects such as cataracts, skin rashes and stress-related diseases are discussed.

As various kinds of radiation from VDTs and their exposure limits are examined, it is pointed out that radio frequency waves and microwaves have primarily been tested for their thermal effects on the body, and exposure limits have been set for this criterion only. Yet it has been discovered that pulsed or modulated radio frequency waves have more effect than continuous wave emissions. Eastern European standards, which take into account the non-thermal effects of these waves, particularly on the central nervous system, are 100-fold lower than Western standards.

The book takes a close look at animal and epidemiological studies on the effects of very low frequency, extremely low frequency, and static electrical fields on the body, indicating that proper measurements of these emissions have not been adequate. Very little study has been done on the synergistic (combined) effects of various kinds of radiation and office working conditions.

An examination of ways to control VDT hazards suggests the development of screens that do not use the cathode ray tube (e.g., liquid crystal or glass plasma) and the use of nickel-permeated cloth to shield the worker from electrical fields and non-ionizing radiation.

Other problems connected with VDTs are discussed, including ergonomics, stress and organization of the workplace. Legislative initiatives and standards in Europe, the U.S., Canada and Japan are compared. The Yukon is cited as the only Canadian jurisdiction that has a comprehensive policy on helping the worker and employer render VDTs safe.

19. **Federal Provincial Advisory Committee on Environmental and Occupational Health. "The Pregnant Worker — A Resource Document for Health Professionals". Health and Welfare Canada, Ottawa, 1986.**

This report was prepared as a resource document to assist physicians, nurses and others concerned with the health of pregnant workers. It offers a framework for the application of sound clinical judgment in analysis of data for individual pregnant workers.

Information on effects of chemical, physical and microbiological agents in the occupational environment on the pregnant female and her conceptus (all products of conception derived from the fertilized ovum during pregnancy, i.e., embryo fetus and embryonic membranes) are reviewed. Available data on ergonomic and psychosocial aspects of working while pregnant are also considered. Recommendations to minimize risks to pregnant workers are presented and information concerning relevant Canadian legislation, contacts and literature resources are included.

20. **Field, Debbie. "Beyond Male Bias in Occupational Health."** ***Healthsharing*****, Summer, 1985, pp. 20-22.**

An interview with Stan Gray, Director of the Hamilton Workers' Occupational Health and Safety Centre, looks at advocacy help the Centre has been giving to workers. Gray says women's legitimate complaints in such industries as textile, electrical, cleaning, and plastics and rubber have not been listened to as much as those by workers in traditionally "male" fields such as mines and steel plants. Many of the Centre's cases have been from women fearful of reproductive hazards at their worksites.

Gray discusses several examples brought to the Centre – lead fumes in an electronics plant, mercury in a battery plant, lacquers and solvents in a paint shop, gases in one plant, pesticides in another. He criticizes the often weak enforcement of health and safety laws that give rise to situations where employers do not know the contents of substances used in the workplace, inspection is inaccurate and faulty equipment is used, government enforcement agencies are biased towards the companies, manufacturers are reluctant to give out toxicity information, and there is a lack of reassignment alternatives for pregnant women in the Province of Quebec.

He also gives examples of problems men have suffered from reproductive hazards such as the case of a man who was exposed to glycol ethers and fathered a child with brain defects.

Sexual harassment is discussed as a health issue by its ability to create a "poisoned work atmosphere". Combatting issues like sexual harassment and reproductive hazards in the workplace has served to bring the women's movement and the labour movement together.

21. **Gray, Stan. "Workplace Reproductive Hazards."** ***Union Women, Newsletter of Organized Working Women.*** **January-March, 1985.**

This article describes various cases of reproductive damage or discrimination workers have experienced on the job and the help they have sought from the Hamilton Workers' Occupational Health and Safety Centre. A particular focus is the Saskia Post case (see Section III).

Another case discussed concerns pregnant women working for Canadian Pacific Airlines who stayed away from their office while it was being painted. Although their doctors had advised the women in this action, they were docked pay for the time they were absent. The article calls for the Ontario government to guarantee the right of women to work and have children by instituting legislation for protective assignment or wage compensation similar to the law in Quebec.

22. **Holdsworth, David G. "Fetal Risk Associated with the Occupational Radiation Exposure of Female Atomic Radiation Workers." Invited paper presented to the Canadian Radiation Protection Association, May, 1984. Ontario Hydro, Toronto, 12 pp.**

This study, through the development of a simple population model, calculates the statistical risk in relative and absolute terms of the damage to the fetus of a woman atomic radiation worker (ARW) in the Ontario Hydro operating environment. The selected endpoints of damage are congenital malformations and childhood cancer.

The study responds to the tension for women between having access to jobs in the nuclear industry and being excluded because of potential pregnancy while working and risk to the fetus.

"The argument which has been used to defend access to women asserts as its principle premise that the risks to the fetus of an unknowingly pregnant female ARW are insignificant in comparison to the weight we must, as a rational society, place on the rights of women to be considered for ARW positions."

To derive the probability of damage to the fetus, the probability of pregnancy is multiplied by the dose of radiation expected during the period of unknown pregnancy and again by the risk per unit dose. These three parameters are estimated by using historical Ontario Hydro Data for expected dose, data provided in Beir III and Unscear 77 for risk per unit dose, and Ontario background figures for probability of pregnancies at Hydro plants.

Readers are cautioned that the figures of risk derived are for societal and corporate decision making and not figures on which individual women would base a decision about whether to work at the plant.

The results, accompanied by conceptual and practical interpretations are: a) that the relative risk of childhood cancer is 50 percent for women (ARWs), while the risk of congenital malformations is 2 to 4 percent; b) that the absolute risk of childhood cancer is two in a hundred that a single case of occupationally caused childhood cancer will occur at Ontario Hydro in the offspring of 20 workers in the next 25 years, while the absolute risk of congenital malformations is one or two per thousand.

23. **Jabanoski, Jeanne. "Breast Milk: An Untold Story." *Healthsharing*. Summer, 1985, pp. 13-17.**

The popularity of breast-feeding is at an all time high – 62 percent of American mothers breast-feed today compared with 5 percent in the early 1970s. Because toxins are stored in body fat and breast milk has a high fat content, breast-feeding is the most direct source of chemical contamination for newborns. PCB contamination of breast milk and its effects on the fetus and newborn have been fairly widely studied, from the findings in Japan after the acute PCB contamination of rice oil to research on women eating contaminated fish in the Great Lakes area. The latter low-level chronic exposure has been found to result in premature births, low birth weight, and infants with signs of slow motor development and weak reflexes. As well, exposure to PCBs in the womb has resulted in a number of infections, illnesses, colds, earaches and influenzas

in the infant's first four months. The average daily dose of PCBs in breast-fed infants is about 50 times higher than in adults. PCBs, which are known to have neurological effects, may be ingested at a time when many sensitive developmental processes, including brain development, are taking place.

Given the fact that PCB contamination is everywhere and there is no established safe level for it or other toxic chemicals in breast milk, how do the advantages of breast-feeding compare with the disadvantages? The conclusion of some studies is that for the first four months the advantages outweigh the disadvantages. Breast-feeding enhances the infant's immune resistance, reduces susceptibility to infection over the child's lifetime, and promotes mother child bonding. Advice to women contemplating breast-feeding includes acquiring knowledge of toxins in the home, neighborhood and workplace and their effects on the body; consultation with the family doctor about what precautions to take; analysis of chemical content of breast milk; and lobbying of governmental agencies to clean up chemicals in the environment.

24. **Kaye, Lynn. "Danger, Keep Out! Exclusionary Hiring Practices by Employers, Reproductive Hazards at Work." Ottawa: the National Association of Women and the Law (forthcoming).**

This paper examines the tension between human rights legislation which prohibits discrimination on the basis of sex in employment and employer practices that exclude women from workplaces that use materials hazardous to the reproductive system. It reviews the small number of cases concerning employer exclusion practices brought before human rights commissions in various jurisdictions. Reasons that complaints have been so few include lack of publicity about women's rights, the lack of clarity as to whether a breach of those rights constitutes discrimination, and the difficulty in proving the employer is really using an exclusionary policy.

Policy issues facing human rights decision makers are examined to determine whether exclusionary hiring policies are compatible with the prohibition of discrimination in human rights legislation. The author concludes that health and safety legislation must control the level of hazard at the source. If the hazard is removed at the source, the burden of responsibility for the fetus is on neither the employer nor the worker. In the interim, however, an employer should be required to apply to a human rights commission for a temporary emergency exemption from hiring fertile women. The employer should furnish, as well, scientific evidence and demonstrate that it is impossible to control the reproductive hazard at the source.

How to defeat an employer's exclusionary policy is discussed in terms of a human rights complaint. What has to be proven is that discrimination exists and that it is discrimination on the basis of sex. Discrimination can be proven: if it is shown that both men and women suffer reproductive damage from the workplace, or that equal protective treatment is given to both men and women when women actually require different protective treatment. Proving discrimination on the basis of sex is more difficult when the definition of sex does not include differentiation on the basis of pregnancy. However, several jurisdictions have amended their definitions to include pregnancy.

In human rights cases, the Canadian Charter of Rights and Freedoms may be more stringent in requiring employers' bona fide efforts to provide equal opportunity in employment by controlling the hazards at the source. A policy which excludes women because of reproductive capacity is open to question because it denies equal benefit before the law and may be considered discriminatory because it excludes almost all women. Sections 6 and 7 of the Charter may also be used in exclusion cases, since these sections specify the right of Canadians to earn a livelihood in any province.

The paper documents cases concerning employer discrimination and failure to inform workers about dangerous substances in the workplace. Conclusions and recommendations specify that policy makers need to develop a total rights package that involves workers' access to information about hazards, prevention of hazards at the source, more research on reproductive hazards, pre-market testing, strengthened right to refuse dangerous work laws, and right to reassignment or wage compensation across the country.

25. **Kaye, Lynn. *Reproductive Hazards in the Workplace: Some Cases*. Toronto: National Action Committee on the Status of Women, 1986, 52 pp.**

This paper presents cases that men and women suffering adverse reproductive outcomes brought to the Hamilton Workers' Occupational Health and Safety Centre (now called Ontario Workers' Health Centre) during 1984-85. Seven cases involving women are presented, ten involving men. Problems include unknown hazards in the workplace, the need for protective reassignment, lack of access to information about materials used in the workplace or inaccurate information, birth defects, infertility, genital cancer, and work with PCBs. Tables at the back of the paper document how workplace hazards affect reproduction, some of the hazards that can affect reproduction, and which occupational sectors present risks to reproduction. An excerpt from a pamphlet describing the means of obtaining protective reassignment or compensation for pregnant women in Quebec is included. As well, the paper provides an example of collective agreement language for dealing with reproductive hazards. A comprehensive bibliography on reproductive hazards makes up the final section of the paper.

26. **Langton, Marianne, "Is Your Job Hazardous to Your Health?" In: *Still Ain't Satisfied*. Toronto: The Women's Press, 1982, pp. 181-194.**

"With our increased knowledge of environmental hazards, workers have begun to pay particular attention to the issue of health and safety on the job. Rather than focusing on the general problem of health and safety in the workplace, employers have centered on the possibilities of harm to the fetus. The fetus is of particular concern to employers because its health and safety is not covered by workers' compensation boards and they are therefore liable to lawsuits. While employers have acted merely to remove women from certain jobs, especially in industry, feminists see that, clearly, the solution is to eliminate the hazards, not the workers. Women must become increasingly vocal and aware of the hazards in all of the jobs we do, in offices and labs, as well as in the home."

27. **Lavoie, Jacques, "La grossesse et le travail", *Objectif Prévention*. septembre-octobre, 1983, pp. 8-11.**

This article looks at the relationship between pregnancy and work, beginning with an explanation of the physiology of pregnancy and how it affects a woman's body. Physical, biological and chemical hazards which can damage the fetus are discussed, and processes of teratogenesis, mutagenesis and carcinogenesis are explained, along with the period at which the fetus is most vulnerable to various hazards. It is stressed that the period of greatest vulnerability is at the beginning of the pregnancy, when the woman is not yet aware of her condition. Diagrams are used to illustrate the points. The second part of the article looks at the four key stages during which reproductive damage can occur: before conception, at conception, during pregnancy and after birth. Risk factors which can result in fetal damage are discussed and displayed in a table on environmental factors (from nutritional state to radiation to working postures), biological factors, and their effects on the fetus. The author discusses the lack of knowledge in industrial toxicology on the reproductive effects of the more than 400 000 chemicals used in the workplace and, except for ionizing radiation, lead and anesthetic gases, on exposure limits taking into account the safety of the pregnant woman or her fetus. Exposure limits such as the American TLVs (threshold limit values) are based on a 70 kg. man and are not necessarily safe for a pregnant woman.

The health care and textile industries are those in which pregnant women are most likely to be exposed to potentially hazardous substances. The author provides an inventory of the principal reproductive hazards found in the nursing profession, including anesthetic gases, sterilizing chemicals, antibacterial agents and chemo-therapeutic medication, radiation, ultra-sound, biological and ergonomic risks. Tables of viruses and their reproductive hazards are presented. The author points out that prolonged standing or sitting can pose particular problems for pregnant women, as can lifting, though little research has been done in this area. One study showed that prematurity significantly increased for women who did not have sufficient rest breaks and for those who had heavy case loads. Workload, shift work and stress are among the aspects of nurses' work which must be studied for their possible adverse reproductive effects.

28. **"Lawsuit Against Factory Unique in Canada." *Occupational Health and Safety*, 7, No. 50 (1984), pp. 1-2.**

The $7 million lawsuit between Saskia Post and English Plastics and suppliers of plastics, resins and solvents is described. Post linked the severe abnormalities of her child to exposure in the womb to such chemicals in the factory as styrene and vinyl chloride. Lawyers on the case say the suit amounts to an environmental tort. The legal action is based on the findings of the Hamilton Workers' Occupational Health and Safety Centre which indicate teratogenic chemicals in the factory were at a high enough concentration to result in the child's abnormalities. Lack of proper information dissemination by the employers at English Plastics has been cited as one of the problems in the case. The company claims the temperature of the machines molding the plastic was not high enough to melt the plastic which would be the only way toxins could be released. (See Section III for information on this case.)

29. **Letourneau, E.G., J. Muller, and D.K. Myers, and "The Female Atomic Radiation Worker." Presentation to Canadian Radiation Protection Association. Toronto, May 3, 1983. 11 pp. (Also available under the title "Harm to Offspring of Women of Child-bearing Age Employed in the Nuclear Industry" from the Advisory Committee of the Atomic Energy Control Board of Canada, Ottawa, 1984).**

This document addresses the Atomic Energy Control Board's (AECB) 1981 proposal to remove the reduced radiation dose rate limits for women of reproductive capacity, making the limits the same for men and non-pregnant women. (This was done in 1985. See Section IV). It reviews the history of the then-current dose limit set in 1974, and its 1960 predecessor which had prohibited the employment of pregnant women as atomic radiation workers. The authors reach the conclusion that "there was no good reason for such a regulation". They discuss the effects of the 1974 regulation as it was applied, for example, by Ontario Hydro. "The balance of the paper studies the risk of harm to offspring of women of child-bearing age when employed as atomic radiation workers. This is one of the many methods that can be used to study this risk and is certainly a very conservative approach." Various hazards during the first 60 days of pregnancy — failure to implant, congenital malformations, cancer, and genetic disorders — are calculated mathematically per unit of exposure. The results are discussed and tables are included. Based on these calculations and the assumption that it is unlikely that any woman's fetus would receive more than the proposed .5 rem during the first two months of pregnancy, the authors conclude that the new AECB regulation "does not put the fetus at any great risk during the possible period of undiagnosed pregnancy".

30. **Levitsky, Marianne, "Protecting Workers from Reproductive Hazards." In: *Women and Reproduction, Canadian Journal of Women and the Law*, Vol. 1, No. 2 (1986), pp. 488-497.**

The article examines the issue of workplace hazards and reproduction from a historical perspective, noting that early occupational health legislation in Canada and the U.S. was designed to protect women and children. The author suggests that such protective legislation was and is a divisive issue among workers. Much of the current controversy concerns employer policies which exclude women from certain jobs. She discusses specific companies and government regulations which establish different exposure standards for men and women, such as the Ontario Lead Regulation and the Atomic Energy Control Board standards (see Section IV). She points out that not only are such policies detrimental to women's employment, but they are also an inadequate method of preventing reproductive damage, since they ignore the risks to men and the damage that can be done to women before conception or to the fetus before a woman knows she is pregnant. Various methods used by workers to win changes in reproductive hazards policies are discussed — human rights challenges, collective bargaining, and legislative improvements. The author expresses doubts that adequate improvements will be achieved in the near future, due to the slowness of the standard-setting process and scientific uncertainty, and presents a number of issues which must be resolved. These include definition of "susceptible worker," compensation for excluded workers, assessment of risks, the right of workers to exercise choice and to receive complete information about the hazards to which they may be exposed. The author proposes, as a possible approach, excluding

workers during periods of "temporary reproductive sensitivity", which might include pregnancy, lactation and periods during which conception is being attempted by both men and women. She concludes with eight directions for change, including more research, improved standard-setting, the right of workers to refuse work which might pose a reproductive hazard, and the creation of independent clinics to advise and help workers.

31. **McDonald, Alison D. "Epidemiology of Spontaneous Abortions, Birth Defects and Prematurity." In: *Papers presented at an international meeting to examine the allegations of reproductive hazards from VDUs*. London: Humane Technology, 1984, pp. 5-27.**

The paper examines factors that cause adverse reproductive outcomes, which epidemiologists must take into account in order to discern whether any of the causes can be attributed to the effects of environmental agents. Reproductive damage can be created through either genetic or toxic mechanisms.

Spontaneous abortions are difficult to study, since many are unrecognized and go unreported. Figures are estimated for the prevalence of this birth outcome. Causes of spontaneous abortion include chromosomal abnormalities, maternal abnormalities, previous recurrent spontaneous abortions which increase risk, the age of the woman, and smoking and alcohol consumption. The paper concludes after surveying some studies that there is no convincing evidence that any exposures at work cause increased spontaneous abortion.

On the other hand, there is an association between birth defects and environmental agents. The effects of several viruses and drugs are examined. Neural tube, heart, cleft lip and palate, and musculoskeletal defects are discussed. Neural tube defects (spina bifida and anencephaly) show striking epidemiological features such as response to seasonal variations and geographical location. Due to the infrequency of particular defects, only high risks are likely to be detected.

Several parameters affect prematurity, which is defined as gestation of less than 37 weeks and or birth weight less than 2 kg. Studies have shown an association between prematurity and social class, race, maternal weight and height, and smoking. If prematurity rates are to be related to occupational factors, the basis of comparison needs to be similar. So many factors affect birth weight that unless it can be assured that the comparison group is satisfactory, differences could well be confounded by the non-occupational factors. (See also McDonald et al., Section II).

32. **Marha, Karl. "Electric and Magnetic Fields Around VDTs — Review of Biological Effects, Standards and Practical Solutions for Reducing Levels." In: *Papers presented at international meeting to examine the allegations of reproductive hazards from VDTs*. London: Humane Technology, 1984, pp. 65-98.**

It has been shown in recent years that, close to and around some video display terminals, DC electrostatic field, pulsed magnetic field, and pulsed electrical field can be measured at levels substantially above the background. The last two

fields are basically in the very low frequency (VLF) range. While levels of VLF radiation are usually insignificant in front of the VDT, relatively high levels can occur towards the side or rear of some terminals.

The paper reviews some of the possible biological effects of electric and magnetic fields in the range from DC to VLF. DC electrostatic fields can cause acceleration of charged airborne particles against the face of the VDT operator resulting in skin rashes and eye problems. A solution would be for the operator to sit farther away. The mechanisms of interaction between electromagnetic fields and living matter are very complex and not fully understood. The non-thermal risks of these fields are thought to occur at the cellular and macro-molecular level, altering the electrical conductivity of the cell and having significant effect on the central nervous system. In addition, pulsed fields have been shown to have more biological effect than continuous waves.

Two studies that show adverse effects on the reproductive systems of mice and on chicken embryos from electrostatic pulse fields and pulsed magnetic fields are presented. However, because the published experiments use electric or magnetic pulses having other repetition frequencies and different wave shapes than those found near video display terminals, one can not say definitely whether the fields emitted from VDTs can produce adverse health effects. Because the biological effects are dependent on field characteristics, it is imperative to experimentally evaluate any biological effects of those actual fields or simulated fields identical to those emitted by some VDTs.

How is the worker to be protected in this time of scientific uncertainty? The paper suggests, because there is no exposure limit for pulsed VLF fields, that levels be reduced as much as reasonably possible. In order to work out methods for doing this, an in-house study to measure VDT emissions at the Canadian Centre for Occupational Health and Safety was undertaken. Copper shielding was devised for the sides and tops of units, and the emissions were considerably reduced. It was also suggested that the workplace be designed so that no one would sit or stand close to the side of or behind the VDT. It is more difficult to remove the pulsed ELF and VLF magnetic field from VDT operation. However this problem will be solved in the future when screens are used that operate on principles differing from the cathode ray tube. The need for high voltage circuits or deflection coils with high currents will be eliminated when new liquid crystal and thin film transistor technology for flat screens are used. These will in fact eliminate all kinds of fields emitted with the present VDTs.

33. **Marha, Karl. "The state of knowledge concerning radiation from VDTs." Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, 1982, 19 pp.**

This paper was prepared in response to continuing complaints from workers whose jobs entail prolonged use of video display terminals. It reviews the present state of knowledge on interactions between different types of radiation and fields from VDTs and the VDT operator and it reflects the contemporary state of knowledge on health problems connected with VDTs.

Potential risks and sources of trouble are explored. In some areas gaps in knowledge exist. One such area is the possible influence of electrostatic and low-frequency fields on biological systems.

34. **Marha, Karl, B. Spinner, and J. Purdham. "The case for concern about very low frequency fields from visual display terminals; the need for further research and shielding of VDTs." Hamilton: The Canadian Centre for Occupational Health and Safety, April 22, 1983, 22 pp.**

This paper has collected and evaluated evidence concerning VDT electromagnetic radiation in response to VDTs users' calls to the Centre expressing fear of reproductive harm from working with the machines. The studies and materials cited examine incidence of pulsed very low frequency electromagnetic fields emitted by VDTs, biological effects of these fields, evidence of detrimental effects from the fields, and the effects of shielding. It was found that there has been no systematic attempt to study the possible effects of such exposure, and research into the area is recommended.

35. **Messing, Karen. "Est-ce qu'on protège la travailleuse enceinte au Québec?" *L'Union médicale du Canada*, volume 111, no. 2, Février 1982, pp. 155-164.**

"Laws and practices regarding the treatment of pregnant workers are meant to protect the health of the woman and her fetus. [The study] describe[s] briefly the mechanisms of mutagenesis, teratogenesis and physiological damage to the woman, in relation to hazards present in the workplace. [It] evaluate[s] practices in North America which seek to protect pregnant women by excluding them from the workplace for the duration of their pregnancy, or which seek to protect fetuses by excluding fertile women. Quebec's Law 17 and the public service worker's contract are discussed. [It is] conclude[d] that employer practices reflect economic need more than a desire to protect workers, and that women, children and future generations are not yet adequately protected in Quebec. [The paper] suggest[s] that physicians alert themselves to the occupational health problems of pregnant women, that they be conservative in evaluating risks in situations where few data are available, and that they encourage research is this area." (English Summary)

36. **Messing, Karen. "Women as Skilled and Semi-Skilled Workers." In: *Working Papers of the Conference on Women and Work*. University of Waterloo, May, 1986, 11 pp.**

This paper describes work at the Université de Québec on hazards associated with work in women's employment ghettos, including reproductive hazards.

37. **Miller Chenier, Nancy, "Protecting Women: Some Aspects of the Debate over Mining, Night Work and Atomic Radiation," Report prepared for Labour Canada, Women's Bureau, Ottawa, May, 1986, 38 pp. (unpublished)**

This report examines protective legislation for women in Canada through an assessment of certain prohibitions respecting mining, night work and atomic

radiation work. The background, implementation and application of a variety of federal and provincial legislation is discussed, as well as changes over the years. The author outlines the positions of various interest groups, their effect on the direction of legislation, and the overall impact of particular legislation on the employment of women in these industries.

Reproductive issues have not been a major factor in the restrictions placed on women doing night work or mining. Historically, concern for morality and labour scarcity were greater considerations. However, the author notes that some mining companies exclude women from particular sections of refineries, out of fear "that pregnant women will be exposed to substances which might injure a developing fetus and lead to legal liability for the company".

In the atomic industry, reproductive concerns have played a very large role in the debate over, and the restrictions placed on, women workers. The first Health and Safety Precautions (1960) of the Atomic Energy Control Board (AECB) prohibited the employment of any woman known to be pregnant. Revisions in 1974 established a lower permissible maximum radiation exposure for female atomic workers of reproductive capacity. Most employers, legally responsible for the exposure levels of workers, reacted by refusing to hire women. Pressure for change came from women seeking employment or advancement in the nuclear industry, who filed complaints with the Human Rights Commission.

The AECB proposed to amend the 1974 regulations, allowing all women workers to be exposed to the same levels of radiation as males, except during pregnancy. Many groups made representations to the AECB on the proposed changes. Labour groups agreed unanimously that exposure levels for all workers should be lowered. While they acknowledge the equality issue for women workers, they criticized the Board for interpreting this concern "as a justification for permitting equal opportunity to exposure to a known carcinogen, genotoxin and teratogen.... Equality of opportunity must be based on equal opportunity to a safe workplace not equal opportunity to biological harm." In addition, labour groups proposed the right to reassignment for male and female workers trying to conceive or (in the case of women) already pregnant, with job and income protection.

Employer groups, citing economic grounds, argued in favour of the proposed regulations, stating that expensive redesign of workplaces would have to be undertaken to reduce exposure for all workers. Also citing financial considerations, the Royal Victoria Hospital opposed the proposal to include nuclear medicine and related workers under the definition of Atomic Radiation Worker (ARW). "[H]ospitals simply cannot afford to designate a large number of employees as ARWs, nor is there any evidence that this is necessary on health or safety grounds." Employer groups also expressed concern over the legal liability from injury to a fetus, and requested the AECB to investigate compensation. The hospital group proposed that workers sign a waiver accepting responsibility for any harm to the fetus during an undeclared period of pregnancy. One group, Women in Science, supported the new regulation, arguing that well-educated and motivated women would consider the welfare of their children and hence should be "made responsible for their own radiation protection".

The author concludes: "The decision to set the standard for female atomic radiation workers at the same levels as [for] male workers heightened the

realization that the issue of health and safety versus equality needs greater attention. The standard decision also emphasizes the fact that industrial economics are probably the most dominant influence in setting regulations." The author also looks at the employment of women who are exposed to ionizing radiation, from medical and dental technologists to nuclear reactor workers, the vast majority being radiological technologists (over 7 000 in 1981).

38. **Miller Chenier, Nancy. *Reproductive Hazards at Work: Men, Women and the Fertility Gamble*. Ottawa: The Canadian Advisory Council on the Status of Women, 1982, 105 pp.**

This book is a comprehensive examination of reproductive hazards in Canada with comparisons to how the problem is handled in the United States and Europe. It addresses several concerns stemming from the issue, namely: lack of knowledge about reproductive hazards; the fact that men as well as women are at risk; lack of statistical data on how many workers are affected by reproductive hazards; failure of the medical and scientific communities to link the incidence of miscarriages, birth defects and other adverse outcomes with parental work histories; discrimination against women by their exclusion from traditionally male jobs under the guise of preventing damage to the fetus.

The book outlines Canadian statistics on adverse reproductive outcomes in the general population and the ways in which hazards can interfere with male and female reproductive processes. Using many Canadian as well as American examples, the book documents case histories of five well-known chemical reproductive hazards: anesthetic waste gases, dibromochloropropane (DBCP, a pesticide that causes sterility in workers), diethylstilbestrol (DES), lead, and vinyl chloride. This section also gives an overview of physical reproductive hazards (ionizing radiation and VDTs), biological hazards, and psychosocial hazards. Each category is accompanied by summary tables illustrating hazards, workers at risk, potential reproductive effect, and protective measures.

A chapter discusses the laws and practices that exclude women of reproductive age from certain workplaces that utilize substances designated as harmful to the fetus (e.g., lead and ionizing radiation). Following an historical view of "protective policies", the chapter gives examples of American and Canadian cases that have recently been at the centre of the controversy. Various approaches to the problem are examined: legal (how protective policies contravene human rights legislation and principles), ethical (men vulnerable to hazards are left to work in potentially dangerous conditions), and economic (women in female job ghettos face reproductive hazards as dangerous as those in traditionally defined "male" workplaces).

Factors that prevent the creation of a healthy workplace are explored in a further chapter. Economic concerns are discussed, looking at comparisons between the cost of workers' health and cleaning up the workplace and noting the reluctance of profit-oriented industry to spend money to reduce hazards at their source. Political issues such as jurisdictional responsibilities and workers' rights are examined. The heavy reliance of government and industry on scientific data is criticized, especially when such data have been proven inaccurate. More emphasis should be placed on the experience and observations of workers themselves. The chapter links occupational health to the broader community and environmental health issues.

The book concludes with a survey of initiatives other countries such as the United States and Sweden have taken to deal seriously with health and safety on the job. Initial work done in Canada is also discussed – reassignment for pregnant and nursing mothers in Quebec and methods used to deal with exclusionary policies – as well as initiatives workers can take and have taken in the area of reproductive hazards.

39. **Nash, Michael. "How Should Employers View VDTs?"** ***Occupational Health and Safety in Canada*****, 1, No. 1 (1985), pp. 8-9.**

Despite government reassurances that VDTs are safe, workers are still concerned about the effects of VDTs on reproduction and may ask an employer for a transfer or a leave of absence. Nash examines general health and safety legislation and legal actions that can be or have been taken due to this concern. He notes there is some consensus about what can be done to reduce hazardous conditions created by the use of VDTs and stresses that employers are obligated to abide by these measures in order to meet their responsibility for maintaining health and safety. Some of the actions employers can take are to ensure proper lighting and chair design, allow for rest breaks from continuous VDT operation, and eliminate electronic surveillance. Some workers have unsuccessfully attempted to avoid VDT work during pregnancy by using the right to refuse work. However, some jurisdictions use the word "imminent" to allow refusal of work only if it is "imminently" dangerous. It is difficult to prove VDTs cause imminent danger. The article does outline how a worker might increase her chances of success in a right-to-refuse case. What more workers are using to avoid hazards are requests for alternative work or leaves of absence. The Quebec law which makes this a legal possibility is described.

The article describes the factors that make it good business sense for employers to be reasonable about granting reassignments or leaves to workers.

40. **Nash, Peggy.** ***Occupational Reproductive Hazards*****. Don Mills: Ontario Federation of Labour, Occupational Health and Safety Training Centre, 1982, 30 pp.**

By not identifying and controlling exposure to hazardous workplace conditions, we are not only risking our own health but we are gambling with the health of future generations.

This paper details the effects workplace hazards can have on the reproductive system or offspring under the categories: "before conception," "during pregnancy," and "after delivery." A number of warning signs that indicate to workers that reproductive hazards might be present are listed. In a series of tables, chemical, biological, physical, and psycho-social reproductive hazards are presented with corresponding columns for "occupational exposure" (kind of workplace), "effect", and "comments".

How reproductive hazards can be identified and tested for is discussed with reference to epidemiological studies and their various uses, the effectiveness of animal testing, and the advantages of bacterial testing.

The paper outlines methods of controlling the hazards — removing or reducing them at the source, on the path to the worker, or at the worker. Many employers choose the least expensive route by removing the worker from the hazard. This shifts the focus of concern from the workplace hazard to the worker. Examples are used to illustrate the issue of excluding women of childbearing age from workplaces that use potential reproductive hazards.

41. **Ontario Medical Association Task Force on Hazards Associated with Ionizing Radiation. "The Pregnant Patient and Ionizing Radiation."** ***Ontario Medical Review*****. May, 1984, pp. 220-221, 239.**

Scientific information outlines the effect medical ionizing radiation procedures have on the fetus. This will help physicians judge the advisability of ordering radiological or nuclear medicine diagnostic procedures for pregnant women. What is under consideration is the risk versus the benefit to the patient and the fetus. Two basic principles are emphasized: a) the fetus is more sensitive than the adult to ionizing radiation; b) ionizing radiation carries a risk which increases with the dose.

The effects of ionizing radiation are examined at different stages: preimplantation, organogenesis, and the fetal stage. At the later stage ionizing radiation exposure is thought to lead to an increased risk of childhood cancer. If the fetus is irradiated after the gonads have developed, genetic damage could occur which might only become evident in the grandchild of the pregnant mother.

A table is presented with the dosages some common diagnostic examinations and nuclear medical procedures will impart to the fetus. Administration of radioiodide is singled out as a particular problem. Once the fetal thyroid gland starts to develop, radioiodide which has crossed the placenta may concentrate within the gland resulting in an unacceptably high radiation dose.

42. **Ontario Ministry of Labour Library. "Reproduction and Occupational Health — Part I: Teratogenesis."** ***Occupational Health and Safety Topics*****, 9, No. 3 (1985), 4 pp.**

Ontario Ministry of Labour Library. "Reproduction and Occupational Health — Part II: Pregnancy in the Workplace." ***Occupational Health and Safety Topics*****, 9, No. 4 (1985) 4 pp.**

These are bibliographies of reference articles available in the Ontario Ministry of Labour Library.

43. **Penney, Jennifer. "Sick of Work." In:** ***The Women's Workbook*****. Toronto: Between the Lines, 1983, pp. 51-63.**

While some women workers are especially sensitive to workplace hazards — during pregnancy, for example — the author argues that women must convince men that it is also in their interests to make workplaces safer, because it lowers the risks for everyone. There are some differences between health and safety issues for men and women, arising from different physical characteristics, but

mainly because of different types of work. The notion that women's work is safe must be countered, as does the "myth of the careless worker."

Reproductive hazards are not taken seriously enough by management, as is evidenced by "their historical opposition to legal requirements for testing the health effects of workplace chemicals." Also, a double standard is applied, and reproductive hazards faced by men are disregarded. This has a negative result for both men and women, leaving men continually exposed to workplace conditions which can lower their fertility, cause defective sperm, or interfere with sexual functioning, while causing women to be excluded from certain work situations. Yet this approach to protecting women is selective, applying mainly to non-traditional occupations. For example, it ignores health care workers who are exposed to a broad range of reproductive hazards, from ionizing radiation to anesthetic gases. Tables are included on how workplace hazards affect reproduction, some toxic chemicals and women workers who may be exposed, and some energy hazards in the workplace.

The author discusses the identification of women's work hazards and various chemical, biological and physical hazards. She examines the reasons workplaces are dangerous and various strategies for initiating changes to make workplaces safer for everyone. Mobilizing the support of fellow workers, working through union health and safety committees, and building alliances with other interested groups are essential parts of a successful strategy, with women workers playing a central role.

44. Pépin, Lucie. "Women in the Workplace and Occupational Health Hazards." *Occupational Health in Ontario*, 5, No. 3 (1984), pp. 109-115.

As new technology invades workplaces that have traditionally been dominated by female workers, it is bringing with it occupational health hazards that are, in many respects, somewhat different from those that affect male workers, and also somewhat different from those that have traditionally been defined as occupational health hazards. They have fewer immediate and visible effects, but are cumulative and thus increasingly dangerous in the long term.

Such hazards include chemical, biological, physical, and psychosocial agents. The latter two are most commonly experienced by women in the work force. Examples of these hazards include heat, noise, lighting, VDTs, and stress.

The approach to combatting hazards must not be on a short-term individual crisis basis. Rather what must be considered is a long-term outlook that deals with the overall conditions that are increasingly eroding the productivity of the worker. Solutions that stress prevention involve the formation of health and safety committees in the workplace, health networks outside the workplace, research into different kinds of chemical hazards and their effects, and legislation. The recommendations of the Advisory Council on the Status of Women are summarized. With a preventative approach worker productivity will be maintained and, in the long run, costs will be saved, especially given Canada's aging population, which may suffer overall ill health in the future due to today's workplace hazards.

45. **Pineault, Raymond, et al., "Rapport du groupe de travail sur les terminaux à écran de visualization et la santé des travailleurs". Institut de recherche en santé et en sécurité du travail du Québec (IRSST), Montreal, 1984, 77 pp.**

The working group, including physicians and an engineer, reviewed the state of knowledge on health risks associated with VDT use, formulated recommendations for the elimination of risks and the protection of workers, and indicated areas where research was still required. In the area of reproductive hazards, the group looked at ionizing, non-ionizing and low-frequency radiation, and workload and design. They observe that, while there are no long-term studies on the health effects of radiation levels from VDTs, the annual dose of ionizing radiation to a VDT user is lower than the lowest level known to have adverse effects. Also, it would be very difficult at such low levels to distinguish the risks from those caused by the natural environment. However, for very-low-frequency (VLF) and extremely low-frequency (ELF) radiation, they review the findings of Marha and others to indicate that when these are pulsed, as is the case with VDTs, there may be cause for concern.

A number of international studies on VDT use and on reproductive and pregnancy problems are presented.

The report concludes that there is reason to believe that ergonomic factors, such as workplace design and the organization of work, can adversely affect pregnancy and reproduction, for reasons that need more research to understand. They recommend preventive reassignment of pregnant VDT operators, and more research into the relationships between stress, static work postures and reproductive problems. They conclude that there is no danger from the levels of ionizing radiation emanating from VDTs, but that the pulsed very-low frequencies may present a risk. They advocate annual or semi-annual inspection of all machines and shielding against low-frequency emissions.

They recommend that the IRSST evaluate research being carried out on VDTs and health, and co-operate where appropriate. If there are gaps, the IRSST should undertake its own research. They propose that the Commission de la santé et de la sécurité du travail (CSST) provide physicians with information on the risk factors for pregnant VDT users and criteria which would indicate protective reassignment of the worker. They note, however, that protective reassignment poses problems; one is that, during the critical stage of fetal development (the second to twelfth weeks), the woman may not be aware she is pregnant and harm can be done before the reassignment can take place. Also, there is the danger of job discrimination against the woman.

The report also recommends the development of guidelines for VDT equipment and workstations and organization — for employers, users, and health and safety committees. The appendix includes a review of legislation and regulations in other provinces and countries, and scientific recommendations. A 251-item bibliography is included.

46. **Purdham, D. J. "Adverse Pregnancy Outcome Amongst VDT Operators – the Cluster Phenomenon." In: *Papers Presented at an International Meeting to Examine the Allegations of Reproductive Hazards from VDUs*. London: Humane Technology, 1984, pp. 27-40.**

The rapid increase in use of visual display terminals (VDTs) – from 7 million in 1980 to 10 million in 1985 – has been accompanied by an increase in complaints of ill health. In the 1980s several clusters of abnormal outcomes to pregnancies among VDT workers have occurred. In this paper the investigation material of eight clusters is reviewed and some of the statistical data associated with it are examined. The conclusions drawn are: it can be demonstrated that the clusters of adverse pregnancy outcome can be explained on the basis of chance alone; while chance is a possible explanation, it is not necessarily the correct explanation; and well-designed epidemiological studies with adequate statistical power will be necessary to properly determine whether there is an association between work with VDTs and adverse pregnancy outcome.

47. **Purdham, J. "Health Hazards to Operating Room Personnel from Exposure to Anaesthetic Gases." Presented to the Canadian Occupational Health Association, Edmonton, Alberta, June 18, 1981, 16 pp. (unpublished)**

This paper reviews the various epidemiological studies investigating hazards from chronic exposure to anesthetic gases, of which nitrous oxide and halothane are the most widely used. The majority of the studies report spontaneous abortions and birth defects among female operating room personnel and the wives of male operating room personnel. The spontaneous abortion rates of 11 studies, mostly carried out in the 1970s, are listed and in several cases are higher than those of the controls. A critique of the methodology of the studies is presented, noting bias in reporting, the use of mailed questionnaires in several of the studies and low response rate for some of them. One significant problem is that the studies have failed to show any relationship between the extent and manner of exposure individuals have experienced and the described effects. Therefore it is not clear that it is the anesthetic gases that caused reproductive failure. The results of animal studies indicate adverse reproductive outcomes at concentrations sufficient to produce anesthesia but at lower levels the results are contradictory.

No studies have yet focused on other agents in the operating room environment such as radiation, stress, infections, or scrubbing agents. Hospital personnel in other stressful areas like intensive care units have also been shown to have high rates of spontaneous abortion.

48. **Ontario Federation of Labour Women's Committee. "Reproductive Risks Cited." *Women's Rights Bulletin*. Nov. 1982, pp. 9-10.**

A submission by the Ontario Federation of Labour Women's Committee to the Ontario NDP Task Force on Workplace Health and Safety is outlined. The issues covered include effects of reproductive hazards on reproductive systems of workers or on their offspring; discriminatory standards developed for exposure to toxic substances; and inadequacy of exposure guidelines that are not designed to

protect against damage to the reproductive system. Examples of reproductive damage are cited to indicate the consequences of this lack of regulation.

49. **Reasons, Charles E., Lois L. Ross and Craig Paterson. "Women's Work/Women's Health." In: *Assault on the Worker: Occupational Health and Safety in Canada*. Toronto: Butterworths, 1981, pp. 79-103.**

Particular emphasis is given the lack of discussion of women in reports and articles about occupational health and safety. One reason given is the neglect of women by workers' compensation boards. They focus on accidents and injuries rather than disease and stress, which are more likely to affect women in the work they do. The boards also ignore women in research, program analysis and hiring practices. Other reasons for the neglect may be the position of women in the work force as the majority of part-time workers and the fact that women are not unionized.

Important reasons to examine women in terms of occupational health and safety include: the participation rate of women in the work force is increasing at a faster rate than that of men; women have not been included in epidemiological studies; the white collar 'female job ghettos' where most women work are not as safe as once presumed; and women are experiencing reproductive hazards on the job that are endangering future generations.

Specific work hazards faced by women in office work are discussed, including hidden hazards such as stress and effects of VDTs. A case study looks at an immigrant female garment worker and her losing battle with Workers' Compensation after suffering allergies from cotton dust. Reproductive hazards are discussed. An examination of Quebec maternity benefits finds them to be the most liberal in Canada. The chapter quotes extensively several of the recommendations of the Advisory Council on the Status of Women concerning reproductive hazards. These include: reducing toxic substances in the workplace, making it illegal to exclude women of reproductive age from the workplace, enforcing standards, disseminating information, and strengthening workers' rights.

50. **St. Amand, Ruth, in co-operation with the Hamilton Workers' Occupational Health and Safety Centre. "Taking Action." *Healthsharing*. Summer, 1985, pp. 18-19.**

This article documents the experience of Saskia Post, who after working eight days in a plastics manufacturing plant discovered she was pregnant and quit, fearful of the effect the fumes in the plant would have on her fetus. Her child was later born retarded and blind, with little muscle strength.

Linking her child's abnormalities to her work at English Plastics, she sought help from the New Democratic Party in Ontario and was referred to the Hamilton Workers' Occupational Health and Safety Centre. The Centre launched a full-scale investigation into the plant, reconstructing the exact chemical substances Saskia was exposed to. It found that some of the air-borne chemicals in the plant were known teratogens – styrene and vinyl chloride. It also determined that

these chemicals could be the agents that caused the baby's particular deformities at the time of his development and exposure in the womb.

Enough evidence was gathered to launch a $7 million lawsuit for damages on behalf of the child against the employer and the suppliers of the chemicals. Reaction of the provincial government to opposition criticism was defensive, based on a misleading report of an inspection of the plant which approved it as safe but during which the air-borne level of fumes was never tested. (See #92 for more information.)

51. **Swinton, Katherine. "Regulating Reproductive Hazards in the Workplace: Balancing Equality and Health."** ***University of Toronto Law Journal*****, 33 (1983), pp. 45-73.**

The article examines legislation and legal cases in Ontario as well as occupational health and safety practices to determine how reproductive outcomes for workers can be protected without contravening human rights legislation that prohibits discrimination in employment on the basis of sex. Presently the Ontario provincial government lead regulation is different for women (.40 mg. L blood) than for men (.70 mg./L blood). Employers have also embarked on policies of banning fertile women from workplaces in order to protect the fetus in case of unplanned pregnancy and inadvertent exposure. The author criticizes the government, employers, scientists, and the legal profession for not addressing the problem of discrimination versus health and safety and exploring alternative policies.

Various dilemmas relating to this theme are pointed out. For instance, should exposure to hazards be reduced to protect the most susceptible entity (the level of exposure considered safe for the average adult may be one which will damage a fetus or young child)? Is the cost of creating a zero-risk work environment prohibitive, jeopardizing the existence of a marginal company and endangering the livelihood of many workers? If a woman is to make a choice about removing herself from the workplace if she wishes to bear a healthy child, how can she adequately understand and evaluate the risk of exposure when scientific studies have not necessarily come to a consensus on such risks? What are the woman's options of finding alternative work at a similar rate of pay? Exposure may also affect the male reproductive system but research has focused primarily on the pregnant woman.

The article describes the various ways government, employers and employees have addressed the situation of reproductive hazards. The circumstances surrounding the government creation of the lead regulations is criticized. It was decided there should be different levels for men and women only after major public hearings were held on what exposure levels should be, so important debate was evaded. The author also criticizes the narrow criterion on which the decision was based — that of scientific evidence and not political, economic or ethical considerations. For example, what would be the economic and technological feasibility of adopting .40 mg. L for all workers or the possibility of allowing all fertile women to choose to work, even if blood level exceeded the limit, if they were not planning to have children and used an adequate method of birth control?

The author explores how differential exposure levels can be challenged by women's lobby groups or through the courts. Citing the *Bliss v A.G. Canada* case she concludes that success would be difficult because the *Bliss* case set the precedent that there is no discrimination on the basis of sex when a pregnant woman is treated differently because the treatment is based on inequality created by nature.

It is pointed out that employers who exclude fertile women from the workplace stereotype women because they assume that because women can bear children they will bear children. Two ways of attacking this policy are described — through the Human Rights Commission or through union grievance and arbitration procedures — and examples are given.

The article suggests that one reason employers may be hesitant to hire fertile women is the chance a woman might sue the employer if she becomes pregnant, linking an adverse reproductive outcome to conditions in the workplace. However, the potential for success of such a suit is in doubt. It is difficult to link birth defects to exact exposure. Often the employee will not have a good record of the type, duration and amount of exposure. The environment or personal lifestyle may be perceived as equally responsible.

Workers have organized means of countering reproductive hazards in the workplace. Two examples are given — the protective reassignment agreement reached by the Ontario Public Service workers fearing harm from VDTs and alternative work guaranteed to Ontario Hydro Employees' Union workers if radiation limits are exceeded. In many cases, however, health and safety issues are not a priority for unions, and for non-unionized workers there is no right to reassignment except in Quebec for pregnant and nursing mothers.

The author analyzes the solutions developed by the Canadian Advisory Council on the Status of Women: prohibition of exclusionary policies, exposure levels set for the most susceptible worker, right to reassignment for men and women or compensation if reassignment is not feasible. She suggests these solutions are not entirely realistic. If the cost of protection is too high, employers will not hire women at all. She concludes that more open debate over the issue is needed.

52. **Vokes, Margaret. "The Human Rights Implications of Exclusionary Policies Based on Hazards to Reproductive Health." Prepared for Mr. James A. Renwick, MPP for Riverdale, Ottawa, September 22, 1981. (unpublished)**

This paper looks at the practice of excluding women from workplaces with known reproductive hazards in order that in the case of pregnancy the fetus is protected. The essential conflict is between the interest in the workers' and fetuses' health and workers' right to be free from discrimination on the basis of sex. Various examples of workplaces that exclude women are discussed. Pending cases of discrimination brought by excluded women to the Canadian Human Rights Commission are described. Industry's arguments for exclusion include: high costs of reducing exposure levels to accommodate the most sensitive organism; lack of technology to allow a hazard-free work environment; and risk of expensive compensation or liability settlements arising from damage to a worker's reproductive health or from offspring born defective.

Critics of this policy argue that reproductive hazards put both women and men at risk and hazards should be reduced to the level of effect to the most susceptible organism. They also maintain that the worker should have the right to decide, on the basis of adequate information, what the risks are from exposure to hazardous substances, rather than being forced to concede to a blanket policy.

The paper summarizes recommendations concerning reproductive health hazards made by the Canadian Advisory Council on the Status of Women, the City of Toronto Executive Committee, and the Ontario Federation of Labour.

An examination of U.S. anti-discrimination laws backed by precedent-setting court decisions upholding civil rights indicate that there is stronger legislation against excluding women on the basis of reproductive capacity in the U.S. than in Canada.

53. **Waterloo Public Interest Research Group. "A Workers' Guide to Solvent Hazards." University of Waterloo, 1985, 94 pp.**

A comprehensive manual for workers on solvent hazards, including reproductive risks, prepared by Cameron Wright. How to get more information on the chemicals used in the workplace and what a worker can do to alleviate hazardous work situations are outlined. The booklet is mostly compiled from existing health and safety sources and includes a list of resources and audio-visual materials, and the addresses of health and safety activist groups in Canada and the United States.

54. **Waterman, Fern K. "Equilibrium of CO Between the Pregnant Mother and the Fetus." *Occupational Health in Ontario*, 5, No. 1 (1984), pp. 10-22.**

The uptake of carbon monoxide by women and its relevance with respect to the fetus is discussed. Studies on smoking and non-smoking women are reviewed. It is concluded that no threshold can be established below which there is a margin of safety for the fetus.

55. **WOSH/Working Women. "Reproductive Hazards: Are You At Risk?" WOSH/Working Women, Windsor, Ontario, 1986, 23 pp.**

An introductory guide to the potential hazards to reproduction present in the workplace. While it is not intended to be a comprehensive manual, it is written in a clear popular style for wide distribution to alert workers who might not have thought of their own risk. It explains what a reproductive hazard is, warning signs that might indicate the presence of a reproductive hazard in the workplace, and risks to some occupational groups, such as health care workers, dental assistants, hairdressers, textile and dry cleaning workers, painters, mechanics, VDT operators, and workers in the plastics industry. It stresses that both men and women are at risk and condemns the common practice of weeding out "susceptible" workers, usually women, as a response to the pressure of a reproductive hazard, instead of ridding the workplace of that hazard. The booklet contains a section on "Taking Action" — investigating and eliminating reproductive hazards in the workplace — and includes suggested contract language for a collective agreement. There is also a table of some known reproductive hazards and their effects, a list of possible sources of exposure, a glossary of terms, and a list of resources.

II. PRIMARY RESEARCH PUBLISHED OR IN PROGRESS

Information about the studies is given in the following order: principle researcher(s), title of the study, organization performing the study, organization funding the study, and date the study was completed or date the study was begun if not completed. In some cases no detailed descriptive information was available.

Titles accompanied by a catalogue number are taken from the *Reference List of Health Science Research in Canada*, 1984-85.

56. **Aubry, F. "Facteur de risque du cancer epithelial de l'ovaire." Epidemiology, McGill University. National Cancer Institute of Canada. In progress since 1983. (7005)**

57. **Bako, G., E.S.O. Smith, J. Hanson, et al. "Epidemiology of Cancer in Alberta 1969-73. Specific Topic Supplement No. 2 — Cancer of the Prostate." Government of Alberta, Provincial Cancer Hospitals Board. Edmonton. January, 1980. Taken from Bako, G. et al. "Cadmium and prostatic cancer in Alberta." *Canadian Medical Association Journal*, Vol. 124 (1981), p. 121.**

During an investigation of the epidemiologic factors associated with the geographic variation in the incidence of prostatic cancer in Alberta (22.5 to 49.7 100 000 population), it was noticed that agricultural practices, water supply, and the amount of cadmium in the environment differed between high and low risk areas of the province.

In the area called census division I in southwestern Alberta, the incidence of prostatic cancer was significantly higher than the average for the province as a whole. Out of the total population, 68 percent drank the water drawn from the South Saskatchewan River, which is formed by the confluence of the Bow and Oldman rivers which carry effluent from industrial complexes around Calgary and run-off waters from irrigated land. Medicine Hat, also in census division I, has the highest incidence of prostatic cancer in all of Alberta's cities and depends totally on the South Saskatchewan River for its water supply. The male population of Medicine Hat represents 66 percent of the total male population of census division I but it contained 88 percent of the patients with prostatic cancer in the division.

The industrial effluents and run-off water from agricultural land released into rivers contain various concentrations of cadmium. In addition, many fertilizers are derived from phosphate rock containing a significant amount of cadmium, which is readily taken up by soil and plants. Although previous studies gave particular attention to cadmium (commonly used in industry) in relation to prostatic cancer, further investigation is needed to enhance our understanding of its effect.

58. **Brien, J.F. "Disposition of Ethanol During Pregnancy." Pharmacology, Queen's University. The Hospital for Sick Children Foundation. In progress since 1983. (84-06)**

59. **Bryant, Heather. "Effect of Working Environment on Pregnancy." Community Health Services, University of Calgary. Alberta Workers' Health, Safety and Compensation. (Unpublished Thesis, University of Calgary, Copyright 1986.)**

The study utilized a questionnaire to examine all women who experienced spontaneous abortions and were brought to three major Calgary hospitals during parts of the year 1984. Two controls were matched for each case, one a pregnant woman at the same gestational age, the same age and parity as the case. The other was a woman who had delivered and was still in the hospital. The purpose of the questionnaire was to ascertain what, if anything, in the woman's occupation and or lifestyle may have caused the spontaneous abortion. Broad questions about occupations were asked: type of occupation, hours worked, job satisfaction, any exposures remembered during the critical first 12 weeks of the pregnancy. Medical and lifestyle questions asked included: past obstetrical history, medical history, smoking, alcohol and drug use during pregnancy, and degree of domestic responsibility.

60. **DeGuirre, Louisa. "Étude descriptive du certificat de retrait préventif de la travailleuse enceinte." School of Occupational Health, McGill University. Institut de recherche en santé et sécurité du travail du Québec. 1983.**

The study analyzes applications of women in Quebec who feel they are eligible for protective reassignment, a right granted to pregnant or breast-feeding women in Quebec if their workplace is assessed to be dangerous to the health of their fetus or newborn. The objective of the study is to ascertain what kinds of workers in what types of workplaces were most successful in winning protective reassignment rights. It was thought, when the law was established, that only the well-educated and or unionized workers would apply and not necessarily the women most at risk, i.e., women in primary sector occupations like factory workers. However, the study has shown, so far, that there is just as large a proportion of women in the manufacturing sector applying and getting reassigned as there are in tertiary sector occupations such as office work, health and teaching.

61. **DeGuirre, Louisa. "Étude de problèmes de la reproduction chez des femmes exposées professionnellement à du mercure inorganique." School of Occupational Health, McGill University, et le Département de santé communautaire de l'Hôpital Sacré-Coeur de Montréal. In progress since 1985.**

The study examines the incidence of spontaneous abortions among workers exposed to inorganic mercury through their work in the fluorescent bulb industry.

62. **Donaldson, D. "Investigation of Detrimental Effects of Nitrous Oxide Pollution on Dentists and their Staff in Dental Practices." Restorative Denistry. University of British Columbia. B.C. Health Care Research Foundation. In progress since 1982. 15(83-1)**

63. **Evans, J. "The Genetic Contribution to Perinatal Mortality." Pediatrics, University of Manitoba. Health and Welfare Canada. In progress since 1983. (6607-1318-52)**

64. **Gallagher, R.P., S. Huchcroft, et al. "Etiological Study of Testicular Cancer." Cancer Control Agency of B.C./Alberta Cancer Board. Health and Welfare Canada. In progress since 1984.**

Incidence of testicular cancer has been rising in Alberta by about 3 percent per year. In 1963 there were 5.8 cases per 100 000, and in 1983 there were 9.6 cases per 100 000. The study is attempting to identify possible risk factors in order that intervention can begin early. Because the overall number of cases in Alberta is small, the study is using B.C. cases as well. Questionnaires have been sent to each case and three controls as well as the cases' mothers. They inquire about the occupation of the cases and controls, hereditary illness, sports participation, conditions during the mother's pregnancy (e.g., whether she smoked), and the cases' and controls' early development (there is a strong association between undescended testicles and cancer).

65. **Hatcher, J.S. and F.M.M. White. "Second Report of the Task Force on Chemicals in the Environment and Human Reproductive Problems in New Brunswick." Faculty of Medicine, Dalhousie University, Nova Scotia. New Brunswick: Department of Health, 1984, 248 pp.**

66. **Hatcher, J.S., and F.M.M. White. "Final Report of the Task Force on Chemicals in the Environment and Human Reproductive Problems in New Brunswick." Faculty of Medicine, Dalhousie University, Nova Scotia. New Brunswick: Department of Health, 1985, 269 pp.**

The second report of the task force focused on trends and patterns of reproductive outcomes in New Brunswick, the assessment of the toxicology and regulation of selected pesticides in the forestry and agricultural industries and the development of an environmental chemical data base for the province.

The Final Report uses the information in the second report to determine any possible associations between the use of chemicals in the environment and patterns of incidence of adverse reproductive outcomes. Particular emphasis was placed on the use of pesticides in the forestry industry, but not to the exclusion of agricultural and domestic use of chemicals.

Measuring trends since 1921, the task force found, compared with trends in Nova Scotia, Quebec and Canada, that New Brunswick has a consistent (though small) excess in stillbirths and perinatal mortality. In view of their frequency of occurrence in New Brunswick, particular attention was paid to such birth anomalies as neural tube defects (anencephaly and spina bifida with and without hydrocephalus) and facial clefts. Although prevalence at birth was low, renal agenesis was also examined, since animal studies have associated incidence of the defect with exposure to phenoxy herbicides used in forestry.

It was found that in comparison with five other provinces under the Canadian Congenital Anomalies System (CCASS) — Prince Edward Island, Ontario, Manitoba, Alberta and British Columbia — New Brunswick demonstrated consistently higher rates for neural tube defects, although it reported lower rates for total anomalies. Statistics from the 1970s were those primarily examined.

Within the province of New Brunswick itself, counties were ranked for nine specific anomaly categories and the combined category "total anomalies". Counties within the Saint John Watershed had generally higher ranks than other New Brunswick counties.

Using a literature survey and analyzing available data, the task force examined in detail the nature and extent of the above mentioned birth defects as well as that of stillbirths and pre-term births.

Recommendations in this section focus on dealing with the high incidence of neural tube defects. They include establishing a maternal Alpha Fetoprotein Screening Program to detect fetuses with neural tube defects and participating in the British study that is using vitamin therapy around the period of conception to see if neural tube defects can be reduced. The task force also recommends that the design and management of hospital and vital statistics be improved in order to have a better data base for epidemiological studies (e.g., all obstetrical records should include a question on the level of schooling and occupation of the parents).

The section of the report concerning pesticides gives background information on the principles of toxicology by explaining the nature and interpretation of toxicology tests. Using scientific literature and information lodged with Agriculture Canada, the report analyzes the reproductive toxicity of insecticides fenithrothion and aminocarb and the phenoxy herbicides 2, 4-D and 2, 4, 5-T. The only chemical noted to cause significant harm to reproduction is 2, 4, 5-T due to its inevitable contamination with 2, 3, 7, 8-TCDD, which is mutagenic, teratogenic in mice at very low doses, reduces fertility in rats and has produced reproductive abnormalities in monkeys.

The task force cites dissatisfaction with the quality and availability of information in the area of chemical toxicity. It notes that because the Government of Canada has no published criteria for assessing the performance of required toxicity tests, the task force had to rely heavily on criteria published by the U.S. Environmental Protection Agency.

Even though the task force was government appointed it was unable to get information on a particular chemical — "Roundup^{R}" — from the Department of Agriculture. Completed tests on any registered pesticide are considered confidential and the property of the manufacturer. Access to any portion of the information requires the permission of both the manufacturer and Agriculture Canada. Denied information by Roundup's manufacturer, Monsanto, the task force had to obtain the information from the United States using the U.S. Freedom of Information Act.

This experience resulted in the following recommendations: that the government of New Brunswick encourage the Government of Canada to develop and publish

Canadian criteria for the performance of required toxicology studies and that the Canadian government ensure that required toxicology information kept by Agriculture Canada be available to any government-appointed inquiry. Further recommendations suggested that licensed chemicals be reviewed by regulatory agencies in case the standards on which the licence was based have become outdated; that there be environmental and product monitoring in relation to public health and the cost be borne by the organizations using the chemicals; that there be analyses of the chemical content of forestry and agricultural products and that the level of 2, 3, 7, 8-TCDD dioxin contaminant be kept below 10 ppm; and that primates be used in toxicity and teratogenicity studies.

The creation of a chemical data base for New Brunswick by the task force was to identify the distribution and patterns of relevant chemical use. The extent of forestry pesticide use was compiled from the records of Forest Protection Limited and Forest Patrol Limited as well as from information supplied by the Department of the Environment. The task force found records of pesticide use in the agricultural area insufficient. It created its own "Agricultural Chemical Exposure Opportunity Index" (ACEO) based on crop production figures in conjunction with recommended pesticide usage patterns.

As a consequence of the lack of information in this area, the task force recommended that the province develop information on agricultural chemical use including actual patterns of storage, use and disposal.

Three methods were used to test for associations between adverse reproductive outcomes and chemical use in the forestry and agricultural industries: geographical correlation analyses, analyses for temporal association, and case-control studies. Results indicated no evidence of any strong or consistent association between any particular forest pesticide and adverse reproductive outcomes.

However, the report did find a significant association between stillbirths in the second trimester and the ACEO Index. It also noted an association between major anomalies in the first trimester and the AECO Index. Spina bifida without hydrocephalus was associated to the ACEO Index with reference to periconceptual exposure (exposure during a period between two weeks before conception and five weeks after).

Based on these results, the task force recommended that further research should be a regional priority in studying neural tube defects and that the research should examine a broader range of hypotheses than that of environmental chemical exposure. Also recommended was more specific research on neural tube defects in the context of the agricultural environment. Since many of the defects studied in New Brunswick are common to the other Maritime provinces, the task force recommended pooling resources and expertise with other provinces in the Atlantic region.

67. Heick, H., and R. Petersson, "Genetic Susceptibility to Toxic Encephalopathy from Exposure to Insect Repellent." Children's Hospital of Eastern Ontario, Ottawa. Health and Welfare, Canada. In progress since 1983. (6606-2420-52)

68. **Hill, G.B. "The Etiology of Prostrate Cancer in Alberta." Epidemiology, Alberta Cancer Board, Edmonton. Health and Welfare, Canada. In progress since 1980. (6609-1177-53)**

69. **Lipman, Abby. "Early Pregnancy Loss: Its Extent, Nature and Relevance for Identifying Hazards to Reproduction." Health and Welfare Canada. In progress since 1984.**

    The study identifies unrecognized termination of pregnancy by collecting daily urine samples from women trying to get pregnant.

70. **Mackenzie, S.G. "Report Bias in a Case-referral Study of Abnormal Outcome of Pregnancy." Epidemiology and Health, McGill University. Health and Welfare Canada. In progress since 1983. (6605-2040)**

71. **Martin, R.H. "Analysis of Chromosome Abnormalities in Spermatozoa from Normal Human Males." Pediatrics and Biology, University of Calgary. Children's Hospital, Edmonton. Health and Welfare Canada. In progress since 1983. (6609-1230-53)**

72. **McDonald, Alison. "Work and Pregnancy in Montreal." Institut de recherche en santé et en sécurité du travail du Québec. In progress since 1982.**

    A large descriptive study has been conducted in Montreal on the relationship between certain workplace exposures and conditions and pregnancy outcomes. Some 55 000 women, who attended 11 Montreal hospitals for delivery (51 200) or spontaneous abortion (4 300), were interviewed by nurse-interviewers between May 11, 1982, and May 10, 1984. The study included about 90 percent of all women who delivered in Montreal in this two-year period, and about three-quarters of the women treated for spontaneous abortion at the same hospitals. Questions from an extensive questionnaire were asked about personal characteristics and habits, previous pregnancies and their outcomes and details of employment during current and past pregnancies. For the pregnancy outcome, special attention was given to spontaneous abortion, prematurity by both gestation age and birth weight, and birth defects.

    A specific goal of the study is to create a data bank in order to undertake analytical studies, mainly case-referent in type, to test hypotheses relating to occupational factors and adverse pregnancy outcomes. (See also McDonald Section I.)

73. **McDonald, Alison D., Benedict Armstrong, Nicola M. Cherry, Claude Delorme, Anna Diodati-Nolin, J. Corbett McDonald, and Diane Robert. "Spontaneous Abortion and Occupation", *Journal of Occupational Medicine*, Vol. 28, No. 12, December 1986, pp.1233-1238.**

    "Occupational factors in spontaneous abortion were studied in the current and previous pregnancies of 56 012 women interviewed in 11 Montreal maternity departments, 1982 to 1984. Ratios of observed to expected abortions (RR), after allowance for non-occupational confounders, were significantly increased (P less

than .05) among nursing assistants and attendants (RR 1.24 in current and 1.13 in previous pregnancies), food and beverage servers (RR 1.31 in current and 1.11 in previous pregnancies), and sales persons (RR 1.18 in current and 1.12 in previous pregnancies). Women whose work entailed heavy lifting, other physical effort, long hours, exposure to noise, and exposure to cold also had significantly increased risk ratios. However, when occupational groups were ranked according to work demands, thus avoiding potential bias from prior knowledge of outcome, increased risks were associated consistently only with heavy lifting and other physical effort."

74. **McDonald, Alison D., N.M. Cherry, C. Delorme, and J.C. McDonald. "Work and Pregnancy in Montreal — Preliminary Findings on Work with Visual Display Terminals." In: *Papers presented at an international meeting to examine the allegations of reproductive hazards from VDUs*. London: Humane Technology, 1984, pp. 161-175.**

This report is part of a large descriptive survey in Montreal analyzing the relationship between work during pregnancy and reproductive outcome (see #72 above). It looks at preliminary findings on spontaneous abortions and birth defects as related to the use of visual display terminals (VDUs).

Out of 12 occupational groupings, five were selected for this study (professional, clerical, accounting, electronic office machine operator, and reception/telephone) in which the use of a VDT for 15 or more hours a week was reported by 5 percent or more of the women in full-time work. The final sample for study amounted to 7 662 pregnancies (only data from women interviewed in the first year of the study were available for analysis in this report).

In comparison, the spontaneous abortion rate for the five occupational groupings using VDTs was in the low range — from 6.3 percent to 7.2 percent — whereas the spontaneous abortion rate for service occupations (restaurant, hairdressing) was 9.1 percent and for dry cleaning/laundry occupations was 13 percent.

There was quite a difference between the overall spontaneous abortion rate for current pregnancies (6.7 percent) in the VDT user occupations and past pregnancies (22 percent). This was explained by the fact that a woman who had a miscarriage is more likely to become pregnant again within a fairly short time than a woman who has given birth at term.

The results showed that in both present and past pregnancies, the spontaneous abortion rate increased from category "no VDT use" to "less than 15 hour VDT use" to "more than 15 hour VDT use". The report offers possible explanations for these increases. For past pregnancies the reasons could be the rapidly increasing rate of VDT use and the very high proportion of spontaneous abortions in recent past pregnancies. For current pregnancies the reasons offered are as follows:

1) Selection bias: Unrepresentative information due to VDT users agreeing more readily to be interviewed than non-users.

2) Response bias: Women who have abortions may tend to exaggerate their use of VDTs compared with women with a normal delivery. Women may err in estimating total hours of VDT use, especially if use is intermittent.

3) VDT design: Visual display terminals could conceivably have become more hazardous in recent years, although there is no evidence of this.

There was no indication of an excess of birth defects in current pregnancies, while in past pregnancies a slightly higher rate of renal and genital defects was observed in children of women who worked with VDTs more than 15 hours a week.

75. **McDonald, Alison D., Nicola M. Cherry, Claude Delorme, and J. Corbett McDonald. "Visual Display Units and Pregnancy: Evidence From the Montreal Survey."** ***Journal of Occupational Medicine*****, Vol. 28, No. 12, December 1986, pp. 1226-1231.**

Data on 56 012 current and 48 608 previous pregnancies were obtained by interviews in 11 Montreal hospitals, 1982 to 1984, after delivery or spontaneous abortion. In 17 632 pregnancies among women in occupations where there was substantial use of visual display units (VDUs), users and non-users had similar rates of congenital defects in both current and previous pregnancies and of abortions in previous pregnancies. In current pregnancies there was an excess of abortions in users, which could have been due to biased recall. In a further analysis of all 42 occupational groups ranked according to percentage use of VDUs, the risk of spontaneous abortion in both current and previous pregnancies was the same irrespective of the amount of VDU use. Thus, the study does not support the suggestion that work with a VDU during pregnancy increases the risk of congenital defect or spontaneous abortion.

76. **Mendelson, R. "Effect of Maternal Lead Exposure and Nutrient Intake on Lead Availability During Gestation and Lactation." Nutritional Sciences, University of Toronto. The Hospital for Sick Children Foundation. In progress since 1982. (82-50)**

77. **Messing, Karen. "Fréquences et types de mutations humaines induites par expositions chroniques et aiguës aux radiations ionisantes." Université du Québec à Montréal. Institut de recherche en santé et sécurité au travail du Québec. In progress since 1985.**

The study examines 1 000 hospital workers by questionnaire, asking about their exposure to radiation and other characteristics of the work environment such as workload and speed. (See also Tierney et al #87.)

78. **Messing, Karen, Ana Maria Seifert and W.E.C. Bradley. "*In Vivo* Mutant Frequency of Technicians Professionally Exposed to Ionizing Radiation." In: Sorsa, M., and H. Norpa (eds.). *Monitoring of Occupational Genotoxicants*. New York: Alan R. Liss, 1985.**

In order to determine the potential of long-term chronic exposure to ionizing radiation to cause genetic damage in cells, the study examines technicians in the radiotherapy and nuclear medicine services of a large hospital in Quebec. Controls used were unexposed workers in the same or neighbouring services.

The method of detecting mutations or genetic damage in cells was an assay of cloned HPRT-Human T-lymphocytes. This method offers the advantage that mutant cells survive and yield offspring and thus mutation is no longer represented by a single dead cell, but by a population of cells whose enzymatic defect can be confirmed, studied and characterized.

Both groups of technicians (27 in number) showed higher mutation frequencies than controls. There was a clear dose-response effect among nuclear medicine technicians, but none among radiotherapy technicians.

The study cites a previous examination of mutation frequencies among two groups exposed to gamma radiation: cancer patients before and after radiotherapy, and nuclear medicine patients before and after ventriculography tests. Mutation frequencies rose in both types of exposure.

It is difficult to relate these results to health problems like reproductive outcomes because so little work has been done in this area. As well, several steps can intervene between induction of mutations and their effect on human health: DNA repair, persistance of the mutation, selection against the mutant cell and eventually, selection against a genetically damaged fetus. Also necessary to consider are workplace conditions like shift work and stress and their ability to effect metabolism and hence the body's vulnerability to mutations. The study team is preparing a questionnaire on workplace environment to be distributed to radiation workers and controls, in order to obtain a description of the context of the radiation exposure. (See also Siefert et al. #85.)

79. **Michalko, K.J. "Mutagenic and Chromosomal Study on Nurse Handling and Administering of Anti-cancer Agents." Pharmacology, Ottawa General, McMaster Medical Centre and Toronto General Hospital. Ontario Ministry of Health. In progress since 1983. (149/R)**

80. **Morgan, R.W. "Reproduction Outcomes in Wives of Coke-Oven Workers." Preventative Medicine, University of Toronto. Ontario Ministry of Health. In progress since 1987. (037/R)**

81. **Peters, D. "Prenatal Stress: Effects on Brain Development." Pharmacology, University of Ottawa. Ontario Mental Health Foundation. In progress since 1984. (#905-84/86)**

82. **Quinn, P.A. "The Role and Treatment of Genital Mycoplasmas in Pregnancy Loss." Bacteriology, Hospital for Sick Children, Toronto. Health and Welfare, Canada. In progress since 1982. (6606-2440-53)**

83. **Renaud, Marc. "Evaluative Research of the Right of Preventative Reassignment for Pregnant Women." University of Montreal. Ministry of Social Affairs of Quebec. In progress since 1984.**

The study questions and surveys the files of women who applied for preventive reassignment in Quebec during pregnancy in 1984 and 1985. Questions include why they sought reassignment, what motivated them to request it, the strategy they used to get it, how their request was processed through the bureaucracy, and what help they had from the involved physicians.

84. **Sharma, H.D. "The Investigation of a Cluster of Adverse Pregnancy Outcomes and Other Health-related Problems Among Employees Working with Video Display Terminals in the Accounting Office at the Surrey Memorial Hospital, Vancouver, B.C." The Hospital Employees Union, 1984, 233 pp.**

In the accounting office of the Surrey Memorial Hospital, a cluster of adverse pregnancy outcomes occurred between 1978 and 1982. Out of seven pregnancies, there were three miscarriages and three children born with abnormalities. The Hospital Employees' Union instituted the investigation with specific instructions that all possible causative agents including electromagnetic radiation exposure from video display terminals (VDTs) be measured with available techniques.

A comparison of measurements between the Perkin-Elmer (P-E) terminals in the accounting office and other VDTs in the medical records office where pregnancy outcomes had been normal indicated that the P-E terminals in the accounting office had significantly higher pulsed very low frequency emissions than those in the medical records office. In addition, detailed personal interviews with employees in the two offices showed a marked difference in reported health effects. "The group working short periods with VDTs with relatively high levels of (pulsed fields), complained of being listless, frequently suffering from headaches, etc. On the other hand, the group working in the medical records office with low emitting VDTs for long periods had no such complaints...."

Also analyzed were air samples and "swab" samples from the VDTs which indicated that no toxic chemicals including polychlorinated biphenyls (PCB) were present.

A survey was sent to each employer working with P-E terminals at the Surrey Memorial Hospital as well as to seven other hospitals to ascertain whether the cluster was a chance occurrence and only confined to Surrey Memorial Hospital. The results, which indicated similar health complaints and abnormal birth outcomes from these other hospitals, prompted more extensive investigation. Further measurements of emissions of levels of ionizing (x-ray) and non-ionizing (ultraviolet, infrared, microwave, radio frequency, very low frequency (vlf) and extremely low frequency (elf)) radiation were low, except that the electric and magnetic fields in the very low frequency regions were found to be relatively high in the P-E terminals.

The literature survey on effects of exposure to electromagnetic (EM) fields to biological objects indicated very little data was available on which to base current

exposure levels. Because so little is known, the study recommended following the ALARA (as low as reasonably achievable) principle concerning the exposure to EM fields, especially the pulsed or modulated EM fields. Anecdotal evidence from VDT workers indicates exposure levels to the "pulsed" 16 KHz electrical field and the 60 Hz and 16 KHz magnetic fields should be limited to less than 25 volts per meter and 2 amperes per meter at the viewing screen respectively. It is estimated that 70 percent of all VDTs in use in the workplace meet the above specifications.

The study noted a link between women using terminals with plastic casing (as opposed to metal casing) and a high rate of adverse reproductive outcome. The fact that some terminals with plastic casing are more likely to have high electrical magnetic fields supports the notion that there is a linkage between high incidence of adverse pregnancy outcomes and exposure to EM fields.

Other recommendations of the study included: improved communications between the administration of the hospital and employees concerning employees' health problems; improved ergonomic organization of the office and VDTs to meet established standards; reassignment of pregnant women to other positions without loss of pay, seniority and benefits; hourly rest breaks for VDT workers; a maximum of five hours work on VDT machines per day; and annual eye examinations.

85. **Siefert, A.M., W.E.C. Bradley, J. Swartz, and K. Messing. "HPRT – Mutant Frequency Among Radiotherapy Technicians is Related to Levels of Recently Received Dose of Ionizing Radiation." Département des sciences biologiques, Université du Québec à Montréal, and Institut du Cancer de Montréal, Montréal, 1987.**

The effect of low doses of ionizing radiation *in vivo* in humans can be studied using the T-cell clonal assay of HPRT-lymphocytes. The assay was used to study mutant frequency of 12 radiotherapy technicians and 12 physiotherapy technicians unexposed to ionizing radiation. Thioguanine-resistant lymphocytes were selected from peripheral blood of radiotherapy technicians and control subjects in 1984 and again in 1986. In both years, radiotherapy technicians "mutant frequencies were significantly higher than the controls"; however, the mutant frequencies of both groups were higher in 1986. Among radiotherapy technicians mutant frequency was related to dose received during the previous six, nine, 12, 24, 36, and 48 months, and to cumulative dose, which ranged from 0 to 77.8 mSv, as registered on personal dosimeters. The correlation was strongest with dose during the six months preceding mutant frequency determination (Spearman $r = .504$, $p = .026$) and was weaker with dose received over longer time intervals. Variations in cloning efficiency of lymphocytes accounted for only a very small proportion of the variation in mutant frequency. Thus HPRT-mutant frequency is related to dose over this very low dose range. Induction of mutants in relatively short-lived lymphocyte populations may account for the decline in the correlation with increased time interval.

86. **Tierney, D., P. Robitaille, K. Messing, "Does a Healthy Worker Effect Exist for Low Birth Weight? A Research-action Approach". Groupe de recherche-action en biologie du travail, Université du Québec à Montréal, Montréal, 1987. (Submitted for presentation at the American Public Health Association, New Orleans, November 1987.)**

Quebec legislation provides that pregnant women whose working conditions present a health risk to themselves or their fetuses have a right to change jobs or to leave with pay for the duration of those risks. This legislation is based on the theory that reproductive outcome will be improved by such a leave. However, some research has shown that women who do not work during pregnancy have worse reproductive outcome than those who do. This can be attributed to the "healthy worker effect", the fact that the working population is generally more fit than the non-working population, since the latter may have handicaps or illnesses which keep them out of the work force. Through a questionnaire study of reproductive outcome among hospital workers (N = 600), the researchers obtained information which permitted them to compare outcomes for workers who did not work during the pregnancy with those who left the workplace after the first, second, or third trimester of pregnancy. This eliminated the need to look at a general population control group whose health status may bear little resemblance to that of the worker population. Mean birth weight was lower among children of women who worked at least one trimester of their pregnancy than for women who took a leave of absence for the whole period (3.30 kg vs. 3.43 kg.). For first pregnancies, non-smoking women who worked had offspring with lower birth weight than those who did not (3.24 kg vs. 3.45 kg). The researchers hypothesize that work has a detrimental effect on outcome in this homogenous population, exposed to numerous environmental stressors such as heavy lifting, radiation, shift work and fast work speed.

87. **Tierney, D., and K. Messing. "The Application of a Research-action Approach to the Identification of Adverse Reproductive Outcomes among Hospital Technicians". Groupe de recherche-action en biologie du travail, Département des sciences biologiques, Université du Québec à Montréal. (Presented at a conference sponsored by the American Industrial Hygienists Association, and American Conference of Governmental Industrial Hygienists, Montreal, May 31 – June 5, 1987.)**

In response to a request from the union representing hospital radiology technicians, a questionnaire study was undertaken to examine the effect on reproductive outcome of workplace exposures to ionizing radiation and other stressors such as workload, work speed, mental workload and shift work. By application of the research-action approach, workers were involved at all stages including the formulation of hypotheses and the conception and distribution of the questionnaire.

Close to 600 nurses and technicians in radiodiagnostic, radiotherapy, and nuclear medicine employed in 20 Quebec hospitals participated in the study. The questionnaire, comprising 168 questions, contains the following sections: i) a detailed description of the worksite environmental conditions and work organizations developed for each of the four groups of workers; ii) the history of each pregnancy of the worker or spouse; iii) questions on fertility of the worker; iv) the personal and occupational history of the worker; and v) the personal and occupational history of the spouse.

Preliminary results on workplace exposures show that 75 percent of the respondents lift heavy weights (greater than 35 kg) regularly and 60 percent consider their work speed to be too rapid. Among the radiation-exposed workers, 34 percent report accidental exposures during the course of their work. Some outcome variables have been analyzed. Work-related accidents are common; 27 percent of respondents have had either a work-related accident or disease at their present job. Mean birth weight for children of women who work at least one trimester of their pregnancy is lower than for children of women who take a leave of absence (3.30 kg vs 3.41 kg; $p = .07$). Prematurity rates (less than 37 weeks) are three times higher for mothers who worked than for those who did not work during their pregnancies. Logistic regression analyses are being undertaken to ascertain the effect of radiation exposure on reproduction among the exposed worker groups.

Emphasis will be placed on describing the research-action approach as an effective way to gain detailed information on both workplace exposure and health outcome and as a method to orient efforts towards the improvement of conditions at work as a means of preventing reproductive problems in the worker population.

88. **Tingle, Aubrey J. "Late Developing Manifestations of Congenital Rubella Syndrome: Clinical Virologic and Immunologic Survey of 170 Children in B.C. with Congenital Rubella Syndrome." Immunology Unit, Children's Hospital, Vancouver. National Health Research and Development Program. In progress since 1980. (6610-1172-54)**

89. **Weisman, H. "Maternal Smoking and Fetal Development: A Study of Histological Changes in Hearts of Rat Offspring Born of Mothers Exposed to Cigarette Smoking During Pregnancy." Pharmacology and Therapeutics, University of Manitoba. Medical Research Council. In progress since 1981. (MA-6985)**

III. LEGAL DECISIONS AND CASES INSTITUTED

A. Right to claim injury on behalf of fetus

90. *Duval et al. v. Seguin et al.* 26 D.L.R. (3d) (1972) 418.

An Ontario High Court Decision allows that a child should have a right to redress for damages incurred before its birth. The case, while based on fetal injury sustained when the mother was in a car accident, does not establish the general rights of a fetus, but it does establish that the child has the right to seek compensation.

91. *The Family Law Act.* 1986, S.O. 1986, c.4 as amended.

Section 65 states, "No person is disentitled from bringing an action or other proceeding against another for the reason only that they are parent and child." Section 66 states, "No person is disentitled from recovering damages in respect of injuries for the reason only that the injuries were incurred before his or her birth."

92. Lawsuit filed on behalf of Timothy Post, son of Saskia Post against English Plastics and its suppliers. Brampton, Ontario. Case withdrawn in 1986 as a result of Timothy's death.*

Nineteen-year-old Saskia Post had worked at English Plastics for eight days in 1983 when she found out she was pregnant. She immediately quit her job. Her son Timothy was born blind, mentally retarded, and with poor muscle control. A $7 million lawsuit was launched on behalf of Timothy, on the basis that Timothy's deformities were a result of his mother's exposure to chemicals in the workplace during the critical first trimester of pregnancy. Investigation of the plant by the Hamilton Workers' Occupational Health and Safety Committee indicated a high degree of polyvinyl chloride, styrene (known teratogens), and other chemical toxins in the air, as well as inadequate ventilation and engineering controls.

After Timothy's death in January, 1986, Ms. Post, in consultation with her lawyers, decided to withdraw the case. The child's death made pursuing it unfeasible because a large portion of the claim was based on the cost of caring for him due to his injuries.

"This case would have been significant for women across Canada because it would have touched on crucial policy issues affecting employer policies in the workplace with respect to equal opportunity for women and protection for the fetus from exposure to toxins. What is a dangerous level? How extensive is the employer's responsibility to inform and clean up? When and how should this information be made available to the employees? What standard of proof applies in making the causal link between hazardous chemicals and birth defects? As a result of the withdrawal of the case, these issues remain undecided by the courts."

* Sources: Kaye, Lynn. "Danger, Keep Out! Exclusionary Hiring Practices by Employers: Reproductive Hazards at Work. National Association of Women and the Law, 1985 (to be published), and telephone conversations with Robert Roth (of the Toronto law firm, Summers and Roth) and Lynn Kaye, February 1987.

B. Is discrimination on the basis of pregnancy discrimination on the basis of sex?

93. *Bliss* v. *A.G. Canada*. (1978) 92 D.L.R. (3d) 417 (SC.C.), interpreting sl. (b) of the *Canadian Bill of Rights*, R.S.C. 1970, app. III.

Bliss challenged s. 46 of the *Unemployment Insurance Act* claiming she had been deprived of "the right to equality before the law" declared by s. 1 (b) of the *Canadian Bill of Rights*. The pregnancy benefit scheme in the *Unemployment Insurance Act* (since repealed) stated pregnant women are eligible for benefits provided they had worked 10 weeks in a qualifying period. Workers in general were required to satisfy a lesser standard of work for eight or more weeks in their qualifying period and demonstrate as well their availability for work.

Bliss, who left work because of pregnancy, could comply with the general qualifications (eight weeks) but not those for pregnant women (10 weeks). However, she was barred from benefits since section 46 precluded a pregnant woman from receiving benefits other than in accordance with the pregnancy benefit section of the Act. Bliss argued that this denied equality before the law on the basis of sex. A unanimous Supreme Court of Canada decision rejected her claim in a judgment by J. Richie, which stated that "any inequality between the sexes in this area is not created by legislation but by nature." If there was discrimination, it was on the basis of pregnancy, not on the basis of sex, for non-pregnant women were treated in the same manner as men.

(It has been argued (Swinton, Katherine, "Regulating Reproductive Hazards in the Workplace: Balancing Equality and Health." *University of Toronto Law Journal*, 33 (1983) 58) that this case sets a pre-*Charter of Rights* precedent that would make it difficult to attack the validity of differential exposure levels for men and women in, for example, lead regulations. The defence would be that there is no discrimination on the basis of sex. Rather, the classification is based on an inequality created by nature, to draw upon J. Ritchie's words in *Bliss*. Discrimination is based on a characteristic of some women (their ability to have children) and not solely on the basis of their sex.

94. *Breton* v. *La société canadienne des métaux Reynolds Ltée*. (1981) 2 C.H.R.R. D532.

The respondent company refused to hire Breton because she was pregnant. The complainant claimed this refusal constituted discrimination on the basis of sex contrary to article 10 of the Quebec *Charter of Human Rights and Freedoms*, since only women can become pregnant. The Court ruled that the legislation in using the word "sex" has outlawed discrimination between men and women, but not discrimination between persons of the same sex. The Court dismissed the action with costs.

95. Government of the Province of Alberta, *Individual Rights Protection Act*, section 7 (1) (i), 1985.

7 (1) (i) "...an employer or person acting on behalf of an employer who a) refuses to continue to employ any female employee or discriminates against any female employee with regard to any term or condition of employment by reason only of pregnancy shall be deemed to have discriminated against that employee because of the sex of that employee."

Quebec Human Rights Commission cases adopt the view that prohibition of sex discrimination in the Quebec *Charter of Human Rights and Freedoms* forbids discrimination between males and females but not between women on the basis of pregnancy.

96. *Leier* v. *C.I.P. Paper Products Ltd.* Unreported Decision of the Saskatchewan Human Rights Commission, Jan. 5, 1979.*

The complainant missed work during the first few weeks of her pregnancy, having been advised by her doctor that she risked a miscarriage. She applied for disability benefits and was refused on the ground that the collective agreement specifically excluded pregnancy-related illnesses from the disability coverage. The question put before the Saskatchewan Human Rights Commission was: "Does exclusion for pregnancy-related disabilities from coverage under an employee disability protection plan constitute sex discrimination?" Although the Saskatchewan Commission expressed strong preference for answering the question in the affirmative, it could not contradict the Supreme Court decision that discrimination on the basis of pregnancy was not the same thing as discrimination on the basis of sex. It suggested that it could only be one and the same if legislation decreed it.

It was after this decision that the Saskatchewan legislature amended its *Human Rights Code* to specifically include pregnancy or pregnancy-related illnesses under its definition of "sex". Section 2 (o) "sex" means gender, and, unless otherwise provided in this Act, discrimination on the basis of pregnancy or pregnancy-related illnesses is deemed to be discrimination on the basis of sex.

* Source: *Vivian Wong* v. *Hughes Petroleum Ltd.* (1983). 4 C.H.R.R. D1488 at 12830-12831.

97. *Christine Marie Davies* v. *Century Oils (Canada) Inc. and Production Supply Company Ltd.* (B.C. Council of Human Rights, James R. Edgett, Member Designate, 1986, unreported).

Ms. Davies applied for and was subsequently offered a clerical position with the two companies, whose operations are closely intertwined. The companies withdrew the offer upon learning that she was expecting a child and would require maternity leave in approximately two months.

The companies disputed that the job offer was withdrawn, claiming rather that, given the nature of the job, Ms. Davies chose not to accept it. In addition, the

companies argued the job required the employee to carry on continuous employment unbroken by any lengthy leave of absence shortly after being hired.

In deciding this case, James Edgett, agreed with the conclusion of Mr. John Doe in the recent *Stefanyshyn** decision, that discrimination because of sex extends to and includes discrimination because of pregnancy.

Mr. Edgett found that the companies failed to provide evidence on the actual costs they would have borne if Ms. Davies had been hired and had subsequently taken maternity leave. Thus, the companies were unable to prove that not being pregnant was a *bona fide* occupational requirement.

Mr. Edgett ordered the companies to: 1) cease the contravention and refrain from committing the same or a similar contravention; and 2) pay to Ms. Davies $3 600 as some compensation for wages lost by the contravention.

* *Carol Stefanyshyn* v. *4 Seasons Management Ltd. carrying on business as 4 Seasons Racquet Club.* (B.C. Council of Human Rights, John I.D. Doe, Member Designate, 1986 unreported).

98. *Nye* v. *Burke*. (1981) 2 C.H.R.R. D538.

The complainant alleged that her contract of employment was terminated earlier than necessary because she was pregnant. The Court ruled that discrimination because of pregnancy is not discrimination on the basis of sex as provided for in Article 10 of the Quebec *Charter of Human Rights and Freedoms*. The discrimination prohibited is discrimination between men and women, not between members of the same sex.

99. *Tellier-Cohen* v. *Treasury Board*. (1982) Canadian Human Rights Commission, intervenor, 82 CLLC para 17,007.

A pregnant employee was denied use of sick leave and annual leave for the purpose of childbirth. Loss of income resulted and the complainant filed a complaint of adverse differential treatment — discrimination due to pregnancy or discrimination on the basis of sex. The complaint was allowed. The complainant was a victim of adverse differential treatment in that she received no income during her entire absence. On the basis of the *Interpretation Act*, which specifies that every enactment be given fair, large and liberal interpretation, the tribunal held that discrimination because of pregnancy constituted discrimination on the basis of sex.

"Judging the equality of sexes on the basis of strict equality constitutes a substantive defect for there are no decision(s) except in situations where men and women are in exactly identical positions. Pregnant women provide a good illustration of the illogical nature of that criteria. Only women can become pregnant; must we accept for that reason that they must be deprived of the benefits which would otherwise be granted?"

Treasury Board v. *Tellier-Cohen* (1983) C.H.R.R. Review Tribunal, D-236.

The Review Tribunal dismissed the appeal lodged by Treasury Board and upheld the ruling that discrimination because of pregnancy constitutes discrimination because of sex. However the Review Tribunal found that pregnancy is not an illness and consequently the employer's refusal to allow the use of sick leave for the purpose of childbirth does not constitute discrimination. On the other hand, the Review Tribunal found that the employer cannot refuse the use of annual leave for the purpose of childbirth, and the Tribunal's order for reimbursement of annual leave and compensation for damages were upheld.

In 1983, the *Canadian Human Rights Act* was amended as follows: S.C., 1976-77, C.33, S. 4; modified to 1980-81-82-83, C. 143, S. 2.3. (2). "Where the ground of discrimination is pregnancy or child-birth, the discrimination shall be deemed to be on the ground of sex."

For further information see Section I #13 for 1987 revision of Canadian Human Rights Commission, Policy on Pregnancy and Childbirth Discrimination.

100. *Vivian Wong* v. *Hughes Petroleum Ltd.* (1983) 4 C.H.R.R. D1488.

Vivian Wong brought a complaint before the Alberta Human Rights Commission that her employment was terminated because she was pregnant. The Board of Inquiry referred three questions of law to the Court of Queen's Bench, one of which was: "Is a dismissal because of pregnancy discrimination because of sex?" "Relying on the *obiter dictum* of the Supreme Court of Canada in the *Bliss* case and on the fact that after *Bliss*, Saskatchewan amended its legislation so that the definition of "sex" in the *Human Rights Code* includes pregnancy, the Court ruled that the prohibition against sex discrimination in the *Individual Rights Protection Act* does not have the effect of prohibiting discrimination on the basis of pregnancy." The Court recommended that for discrimination because of sex to cover pregnancy, it will have to do so specifically in legislation, as has been done by the province of Saskatchewan.

C. Cases combatting exclusionary policies

101. Canadian Human Rights Commission. Summary of Decisions Taken at Its Meetings of the 13 and 14 of October and 16 and 17 of November, 1981, pp. 1-2.

A Parry Sound, Ontario, woman, Patti Coulter, was refused employment as a nuclear operator trainee by Ontario Hydro because the employer could not guarantee that she would not be exposed to doses of radiation in excess of the limits set down in Atomic Energy Control Board regulations for women who may become pregnant. (Schedule II of the Regulations, which outlines the maximum permissible doses of radiation a worker may receive within a specific period, specifies lower radiation levels for female atomic radiation workers of reproductive capacity than those for other atomic radiation workers: 1.4 rem per quarter year for whole body, gonads and bone marrow, compared with 3 rem per quarter year for men and non-fertile women.) Further, Ontario Hydro argued that it did not have enough "non-exposed" jobs to transfer women to, if and when they did reach the legal limits of exposure in their regular jobs.

During the investigation of Patti Coulter's complaint, the AECB announced its intention to change its regulations. The changes proposed the same dose limits would apply to male and female workers (i.e., 3 rem per quarter year for men and women) and that a lower dose than in the schedule would apply to pregnant women (.06 rem for any two-week period or 1 rem for duration of pregnancy).* The female worker is, herself, responsible for ensuring that she stays within those limits when pregnant or likely to be pregnant, and the employer is responsible for making sure that female workers are aware of these limits.

* The new regulation was adopted April 1985. See Section IV(b) of this publication.

102. **Canadian Human Rights Commission. Summary of Decisions Taken at its Meetings of the 17th of October and 21st and 22nd of November, 1983. p. 7.**

In 1983, six women who all handled toxic chemicals in the explosives area of a Canadian Arsenals plant, complained that they had been laid off upon reporting in accordance with a requirement to report pregnancy at first awareness. They argued they should have been transferred from a toxic to a safe area. The company argued there was no other available work at the time except office work and the complainants did not have the skills to perform the available work. The complaint was dismissed on these grounds.

103. **Canadian Human Rights Commission. Summary of Decision on the complaint of four Flin Flon women against Hudson Bay Mining and Smelting Company, November 1985, Chairman D. Vickers.**

The complaint is against the company for introducing a lead testing program for women only and excluding women from jobs where they would be exposed to lead. The case went to a Canadian Human Rights Tribunal in December, 1984.

The parties agreed to a "Lead Program" and a "Guideline to Physicians" which encouraged "fertile female employees to notify a company physician as soon as possible if she intended to, or had become pregnant. The physician is required, under the "Guidelines", to measure their blood lead levels and, if this exceeds 20 µg per 100 g of blood, counsel her "to avoid reproduction" until her blood lead level dropped below that level, and to advise the company to move her to an area where her exposure would be lessened, where she would receive the salary of the job to which she is transferred. If the woman is already pregnant, and her blood lead level exceeds 20 µg per 100 g of blood, she will be immediately transferred to an area with less exposure, where she will retain her salary, and will be entitled to return to her former job following maternity leave.

104. **Nova Scotia – Unreported, Interview with Director of the Nova Scotia Human Rights Commission. Excerpted from Kaye, Lynn. "Danger, Keep Out! Exclusionary Hiring Practices by Employers, Reproductive Hazards at Work." Ottawa: National Association of Women and the Law, 1985, p. 5. (to be published)**

In Nova Scotia, although no cases have gone to a Board of Inquiry, there was an inquiry by a union which resulted in an agreement between parties. The employer had a policy of excluding all women from one department in an electronics company because of exposure to radiation. The Human Rights Commission became involved informally and advised the company of the legislation which requires that the employer had to show a bona fide occupational requirement based on sex in order to exclude the women. (Discrimination on the basis of a prohibited characteristic, such as sex or religion, is justified if absence of that characteristic is necessary for satisfactory job performance or if the adjustment to that characteristic will create undue hardship for the employer.)

A blanket exemption would not be acceptable to the Commission, which advised treating each case on its own merits. There would have to be objective evidence showing there was a more definite effect on women than on men. The company was not monitoring and was relying on safety and health literature. The agreement struck provided that women had to understand the risk and then could work in the department.

105. **Ontario Human Rights Commission. Taken from Kaye, Lynn. "Danger, Keep Out! Exclusionary Hiring Practices by Employers, Reproductive Hazards at Work." Ottawa: National Association of Women and the Law, 1985, p. 6. (to be published)**

A complaint by a woman who was refused the right to bid on certain higher paying jobs in a section of the Sudbury INCO nickel refinery is pending referral to a Board of Inquiry. In 1976 INCO Ltd. in Sudbury decided to exclude women of childbearing potential from certain sections of their nickel and silver refineries. The antidote for over-exposure to nickel carbonyl gas, sodium diethyldithiocarbamate, has not yet been tested for its effect on a fetus. In the silver refinery, the use of selenium and tellurium was cited as the reason for excluding women because of evidence linking these substances with congenital abnormalities in animals.

(In February of 1988, an Ontario Human Rights Commission decison ordered Inco to assign Laurene Wiens to a job in its nickel refinery carbonyl section. The decision ruled that the company's refusal to promote Wiens constituted sexual discrimination.)

D. Right to refuse work and right to protective reassignment

106. ***Re. Barss and Ministry of Education.* 345/81 (Jolliffe – Ont. G.S.B.).**

Section 23 of the *Ontario Occupational Health and Safety Act* specifies the right to refuse work. This section was invoked by a pregnant woman who refused to work with a VDT. The grievor had asked her doctor's advice on the dangers of

the VDT and, in Jolliffe's opinion, it was reasonable for her to rely on his advice that the fetus was in potential danger. She was entitled to be reassigned to a job away from a VDT for reasons of health and to maintain her rate of pay.

(This is one of the many arbitration cases which has taken a more subjective approach to the reasonableness of the refusal and interprets s. 23 as an extension of the right of refusal to the most susceptible worker, including the pregnant woman. See Swinton, Katherine, #51.)

107. ***Re. General Motors of Canada and the United Automobile Workers Local 222.*** **(1979) 24 L.A.C. (2d) 388-395.**

In 1975 General Motors in Oshawa requested that female workers in the lead storage battery division show proof of sterility or submit to a transfer to a lead-free area of the factory where the jobs paid less. Some women took a complaint of sex discrimination to the Ontario Human Rights Commission where it was rejected. One commentator (Katherine Swinton) has indicated that "No reason for the Commission's decision was given, but it seems that it took the view that the action to avoid potential danger to the fetus was justifiable and, therefore, there was no need to appoint a board of inquiry to look into the complaint." Swinton, Katherine. "Reproductive Hazards in the Workplace: Balancing Equality and Health." *University of Toronto Law Journal*, 33 (1983) 61.

The issue of discrimination on the basis of sex was taken to a union grievance, but was consequently replaced by the argument that the effect upon the fetus, where impregnation was caused by males similarly exposed to lead, was such that these men too should be excluded on the same basis as the female group. Arbitrator E.E. Palmer rejected the union's submission on the basis that women can be treated differently from men because of their procreative function. Because medical evidence shows that exposure to lead can harm fertility and fetal health, the exclusionary policy for women is clearly reasonable and non-discriminatory, because fertile women are at greater risk than men.

Palmer did indicate, however, that if men feel lead will endanger their health at the worksite, they should be able to refuse work: "...an employee may not be disciplined where he refuses to do work which he truly believes to be unsafe where, among other things, such a view is reasonable and validly held. It would follow, therefore, that male employees in their fertile years might well be able to refuse the type of work here in question without fear of discipline. They should use their right under Occupational Safety and Health Acts to refuse unsafe work."

108. ***Government of B.C. and B.C.G.E.U.*** **(1983). B.C.D.L.A. 740 - 06. A-125/83. R. McDonald. B.C. Lab. Arb. July, 1983. p. 24.**

The British Columbia Government Employees' Union filed a grievance on behalf of a woman who refused to work on a VDT because she wished to become pregnant and was concerned about the safety. Her employer, with the help of a Workers' Compensation Board inspector, tried to convince her that no hazard existed. She still refused to work and was laid off. The arbitrator denied the grievance, finding that the grievor had "no reasonable cause, on the basis of

safety claims, to refuse to train and work" on the VDT. The union appealed and lost. (See Government of B.C. and B.C.G.E.U. (1984). B.C.L.R.B. 30-15. L.R.B. 41 84. P.R. Sheen in *B.C.L.R.B. Decisions*, May 1984. p. 9.)

109. ***Surrey Memorial Hospital represented by Health Labour Relations Association of B.C. and Hospital Employees' Union, Local 180*, August 20, 1985 (Dalton L. Larson) unreported.**

Several women operating VDTs at this hospital began experiencing problems such as headaches, miscarriages, and children with birth defects. An investigator was brought in to test the monitors. His preliminary recommendation in early 1983 was that the terminals should be shielded. When no action was taken by management, the employees exercised their right to refuse work they believed to be dangerous to their health (Cohen and White, 1986). The matter eventually came before an arbitrator resulting in a binding settlement which imposed many safety and general ergonomic guidelines on the employer. Some of these included monitoring the level of radiation emitted, eye examinations, and periodic rest periods for those working at the terminals. As well, pregnant women were granted the right to transfer from VDTs with a guarantee of their position on return (Cohen and White, 1986, p. 98).

Arbitrator Dalton Larson, stated that "the jurisprudence would appear to support an unequivocal right of a pregnant employee to refuse to operate a VDT". He went on to outline the options a pregnant employee had under the Master Agreement covering the Hospital Employees Union members including: (a) exchanging positions with another employee, (b) bidding on a posted vacancy (on a temporary basis), and (c) taking an unpaid leave of absence. The burden, it appears, is on the employee to locate another position and not on the employer to provide protective reassignment (Larson, unreported, 1985, pp. 26-28).

Two of the cases that Mr. Larson considered that dealt with the rights of pregnant women were *British Columbia Telephone Company and Telecommunications Workers Union* (1982) Labour Arbitration Decision C-9 82 (Joseph M. Weiler), and *Pacific Press Ltd. and the Vancouver New Westminster Newspaper Guild, Local 115d* (1984) BCDLA 95-01 A16 84 (Gabriel M. Somjen). In *B.C. Telephone Co.* a temporary employee was "forced to resign" in effect, when she became pregnant and the company refused to transfer her from her job to a position where she would not have to use a VDT. She had consulted with her doctor who had "expressed a real concern for the safety of the fetus". However, the company did not consider that she had the right to reassignment since she was not a regular employee. But since the company had transferred two other temporary employees for the same reason by making them regular employees first, and since the company was obliged to provide a safe working environment for its employees, arbitrator Joe Weiler found that the resignation was forced upon her and ordered the company to reinstate and compensate her.

In *Pacific Press Ltd.* a female employee was offered alternative employment but preferred her regular job as a reporter. Her regular practice was to input and edit on the VDT. When it was confirmed that she was pregnant, she did not want to continue using the VDT because of the research she had done herself for the union on the potential hazards of VDTs and because her doctor could not assure

her that using a VDT would be harmless to the baby. The company offered her two alternatives: (1) to use a lead apron or (2) transfer to a research position for the same pay until she delivered. She would have preferred to continue reporting by either typing her stories or phoning them in. The company maintained that typing the stories, which would then have to be input into the computer by someone else, would be too time consuming for reporting current events and the mechanism for phoning reports in was for special circumstances and was not sufficient for any reporter to use on a regular basis. Arbitrator Gabriel Somjen found that the employer had acted reasonably and not violated the collective agreement and consequently dismissed the grievance.

110. ***Nugent* v. *Bell Canada* (1982). C.L.R.B.R. 416 (Can.).**

A pregnant worker refused to work at a VDT because of the potential health risk. A Labour Canada safety officer found that there was no imminent danger, but the complainant continued to refuse. It was held that following this finding, the right to refuse ended and any other rights the woman might have would have to be decided by the grievance arbitration process.

In July 1982, an arbitration board award to the *Ontario Public Service Employees Union* provided that pregnant employees working on VDT terminals are to be assigned to other jobs at their request. Source: Bertinuson, Janet. "The Reproductive Rights of Workers." Presented at the Fourteenth Annual Health and Safety Conference, Canada Safety Council, Calgary, Alberta, Oct. 6, 1982, p. 8.

111. **Ruttan Case, as reported in *Globe and Mail*, December 18, 1982, p. 4.**

Mary Lou Ruttan, a pregnant woman employed as a counsellor for the mentally handicapped, refused to work on the grounds that exposure to hepatitis in her workplace could harm her unborn child. Her work refusal was denied by an Ontario Ministry of Labour inspector on the basis that she was not in imminent danger and that the fetus is not specifically covered by the Ontario Occupational Health and Safety Act. After the matter was raised in the Legislature, the Minister of Labour overturned the inspector's ruling. After consultation with the Attorney-General, it was concluded that there was no distinction between a worker and her unborn child under the Act: in effect, any risk to the fetus enumerated in the law would be assumed to be a hazard to the mother. The Minister also undertook to have the staff of the Department of Labour look into informing women of this right. Ms. Ruttan was transferred to another part of the centre, and subsequently gave birth to a healthy child.

112. ***Sibly* v. *Atomic Energy of Canada* (1983). 3 C.L.R.B.R. (N.S.) 409; 52 di 137.**

A pregnant worker was found not to be in imminent danger when using a VDT. Reliance was placed on a document published by the Department of National Health and Welfare. A Treasury Board Guideline allowing temporary transfer for pregnant VDT operators was in effect but did not apply to Crown corporations such as the employer in this case. This guideline — (Treasury Board PMM

Bulletin 200-1 of June 17, 1982. In: Canadian Employment Safety and Heath Guide, Sec. 25,015. Ottawa: CCH Canadian Ltd. 1985) – states, "In response to concerns expressed by some VDT operators, and based on employer-employee relations considerations, the above Bulletin provides that an employee requesting a transfer may be temporarily transferred to other work if it is available; if not available, and the employee so decides, leave without pay may be granted."(This applies to all public servants working for the Canadian government but not for Crown corporations.)

(Note: Parliament passed amendments to the *Canada Labour Code*, Part IV, proclaimed March 31, 1986, which delete the references to "imminent" danger, thereby allowing a work refusal in situations that the worker believes might present a danger to safety and health in the long term.)

113. ***Re. Ashcroft* v. *Swan Valley School District. 1983* (from FACT SHEETS, Workplace Safety and Health Division, Manitoba Department of Environment and Workplace Safety and Health).**

Mrs. Ashcroft, a school teacher, was exposed to rubella at the workplace during her first trimester of pregnancy. On the advice of her physician, she remained off work until the status of her immunity could be determined. The school board refused to pay her wages for the five days she stayed away from work. Ashcroft alleged that the school board took discriminatory action in the form of "reduction of wages" (*Workplace Safety and Health Act*, section 1(g)). The Manitoba Labour Board determined that there was no distinction between a pregnant worker and her fetus, and that the protection conferred by the Act to the pregnant worker would include her fetus. The Manitoba Labour Board determined that Ashcroft had the right to refuse, but since alternate work was not available, the employer did what was reasonably practicable (sent rubella-infected child home, granted leave of absence to Ashcroft). The Board dismissed an application seeking remedy for discriminatory action.

IV. LEGISLATION AND REGULATIONS RELATED TO SAFEGUARDING REPRODUCTIVE HEALTH

A. Right to refuse dangerous work

All jurisdictions have some legislated provision for the right to refuse dangerous work. In no jurisdiction does this legislation address pregnant workers specifically. Some of the landmark cases which interpret the right to refuse regarding pregnant workers are contained in Section III (d).

B. Right to protective reassignment

Quebec is the only jurisdiction with legislation granting pregnant workers the right to protective reassignment as follows:

114. ***An Act respecting Occupational Health and Safety of Quebec*, S.Q. 1979, c 63, ss 40-48.**

Re-assignment of a Pregnant Worker

Section 40. A pregnant worker who furnishes, to her employer, a certificate attesting that her working conditions may be physically dangerous to her unborn child, or to herself by reason of her pregnancy, may request to be re-assigned to other duties involving no such danger that she is reasonably capable of performing.

The form and tenor of the certificate are determined by regulation, and section 33 applies to its issuance.

Section 41. If a requested reassignment is not made immediately, the pregnant worker may stop working until she is reassigned or until the date of delivery.

"Delivery" means the natural or the lawfully, medically induced end of a pregnancy by childbirth, whether or not the child is viable.

Section 42. Sections 36 to 37.3 apply, mutatis mutandis where a female worker exercises her rights [sic] under sections 40 and 41. (1985, c. 6, s. 527)

Section 43. A worker who exercises her rights under sections 40 and 41 retains all the benefits attached to her regular employment before her reassignment to other duties or before her work stoppage.

At the end of the worker's period of reassignment or work stoppage, the employer must return her to her regular employment and grant her the benefits she would have been entitled to had she remained in her employment.

The worker continues to receive the social benefits recognized for her workplace subject to payment of the exigibles assessments, part of which is assumed by the employer.

Section 44. On receiving an application from a pregnant worker, the Commission may make temporary payments if it is of the opinion that it will probably grant the indemnity.

If the Commission concludes that the application should not be granted, the amounts paid as temporary payments are not recoverable.

Section 45. The cost relating to the payment of the indemnity shall be charged to all the employers. (1985, c. 6, s. 528)

Section 46. A worker, who furnishes to her employer a certificate attesting that her working conditions involve risks for the child she is breast-feeding, may request to be reassigned to other duties involving no such risk that she is reasonably capable of performing.

The form and tenor of the certificate are determined by regulation, and section 33 applies to its issuance.

Section 47. If the requested reassignment is not made immediately, the worker may stop working until she is reassigned or the child is weaned.

Section 48. Sections 36 to 37.3, 43, 44 and 45 apply, mutatis mutandis, where a worker exercises her rights under sections 40 and 47. (1985, c.6, s. 529)

C. Exposure limits to radiation and substances

The following limits are in force regarding exposure of pregnant workers to radiation, and exposure of women capable of bearing children to mercury and lead.

115. ***Atomic Energy Control Act*, R.S.C. 1970, C A-19**

Permissible Doses

Section 19 (4) Every woman shall

(a) if she becomes pregnant while she is engaged by an employer as an atomic radiation worker, inform the employer of her pregnancy as soon as she becomes aware of it; or

(b) if she is aware that she is pregnant when an employer engages her as an atomic radiation worker, forthwith inform the employer of her pregnancy.

(5) An employer, who is informed pursuant to subsection (4) of the pregnancy of any atomic radiation worker, shall forthwith inform any licensee in respect of whose business the employee is working, of the pregnancy.

On April 9, 1985, an amendment to the *Atomic Energy Control Regulations* came into effect, which changes the law concerning ionizing radiation dose limits for women. The amendment provides that the dose limits for female atomic radiation workers are now the same as for male atomic radiation workers, except during periods of pregnancy when a limit on a total dose of 1 rem or 10 mSv and a dose rate restriction of .06 rem or .6 mSv per two weeks are applied.

116. Radiation Health and Safety Regulations, 1981. Newfoundland Regulation 36/81, filed under *The Radiation Health and Safety Act*.

Section 13.5. A radiation worker, radiation technician in training or student who is pregnant or who is suspected of being pregnant shall not while occupied as a radiation worker, radiation technician in training or a student receive a dose to the abdomen in excess of five hundred millirem during the remaining period of pregnancy.

Section 15.1. A radiation worker, radiation technician in training or student who knows or suspects that she is pregnant, shall report such facts or suspicion to her employer or the person in charge of her training.

Section 15.2. If the pregnant person desires to continue in employment or training, the employer or person in charge of her employment or training may, together with the pregnant person, reassess and revise as indicated the employment duties or training activities, to ensure the maximum permissible dose for a pregnant person is not exceeded.

117. Saskatchewan

Regulation 3 (5) under the existing *Radiation Health and Safety Act* sets the maximum permissible dose of ionizing radiation at 1 rem to the abdomen during the remainder of the pregnancy from the time the pregnancy is reported.

Regulation 5 (1) under the existing *Radiation Health and Safety Act* requires an occupational worker, a radiation technician in training or a student who knows or suspects that she is pregnant to report such fact or suspicion to her employer or to the person in charge of her training. Regulation 5 (2) requires the employer or the person in charge of her training to reassess and revise the woman's duties to ensure that the maximum permissible dose for a pregnant person is not exceeded.

The draft revised Radiation Safety Regulations require a lower quarterly exposure dose for female workers of reproductive capacity and a more controlled exposure during the remainder of the period of pregnancy once it is known. The same requirement is now in effect for female workers in uranium mines through a mine lease agreement.

118. Yukon

Section 12 (2) of the Radiation Protection Regulations states that where a pregnant worker wishes to continue her employment the employer shall revise her duties to ensure that a maximum radiation dose of 0.1 rem month is not exceeded.

119. **Lead Regulations in Ontario. Reg. 536/81, filed under the *Ontario Occupational Health and Safety Act* R.S.O. 1980, c. 321. Code for Medical Surveillance, s. 4 (1)(a) (i).**

Under section "action levels" of this code, it is stated a worker must be removed from lead exposure if his or her blood lead concentration exceeds .70 mg/L, unless the worker is a woman capable of bearing children, [in which case] she must be removed when her blood level concentration exceeds .40 mg/L in order to safeguard a developing fetus.

120. **Mercury Regulations in Ontario. Reg. 141/82, filed under the *Ontario Occupational Health and Safety Act*. R.S.O., 1980, c. 321.**

Medical Surveillance Programme – Under section (5), Health Education, it is stated that "[E]xposure of females capable of bearing children should be kept to a minimum".